TRANSCRIPT OF RECORD

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1936

No. 41

THE UNITED STATES, PETITIONER

vs.

ROBERT ESNAULT-PELTERIE

ON WRIT OF CERTIORARI TO THE COURT OF CLAIMS

PETITION FOR CERTIORARI FILED APRIL 24, 1936
CERTIORARI GRANTED JUNE 1, 1936

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1935

No. 963

THE UNITED STATES, PETITIONER

vs.

ROBERT ESNAULT-PELTERIE

ON PETITION FOR WRIT OF CERTIORARI TO THE COURT OF CLAIMS

INDEX

	Original	Print
Record from Court of Claims	1	1
History of proceedings	1	1
Fourth amended petition	2	1
General traverse	9	5
Argument and submission of case	9	5
Further proceedings in case	9	5
Special findings of fact	11	6
Conclusion of law	40	38
Opinion of the court, Booth, Ch. J.	40	38
Judgment	75	75
Clerk's certificate [omitted in printing]	76	75

	Page
Order allowing certiorari	76

64298—36——1

1 In Court of Claims of the United States

No. D-388

ROBERT ESNAULT-PELTERIE

vs.

THE UNITED STATES

I. *History of proceedings*

The original petition in this case was filed June 20, 1924, by George W. Wickersham, Esq., as attorney of record.

On July 18, 1924, on motion made therefor and allowed by the court, Cadwalader, Wickersham & Taft were substituted as attorneys of record.

On August 20, 1924, the defendant filed a general traverse to said petition.

On December 13, 1924, on motion made therefor and allowed by the court, the plaintiff filed an amended petition.

On February 28, 1925, the defendant filed a general traverse to the amended petition.

On August 12, 1925, the plaintiff filed a second amended petition.

On March 26, 1927, on motion made therefor and allowed by the court, the plaintiff filed a third amended petition.

2 No demurrer, plea, answer, or notice of a counterclaim, set-off, claim for damages or demand in the premises having been filed by the defendant, a general traverse was entered by the clerk as provided by Rule 34.

On February 11, 1928, on motion made therefor and allowed by the court, the plaintiff filed a fourth amended petition which is as follows:

II. *Fourth amended petition*

Filed Feb. 11, 1928

To the Honorable the Court of Claims:

The Claimant, by Cadwalader, Wickersham & Taft, his attorneys, respectfully represents:

For a First Cause of Action

Upon Information and Belief

1. At all times hereinafter mentioned the Claimant has been and still is a citizen of the French Republic, and resides at 43 Boulevard Lannes, Paris, France, and was beyond the seas during June 1917, and since then was at no time in the United States before June 21, 1921.

2. The French Republic accords to citizens of the United States the right to prosecute claims against it in its courts, and such claims may include those for breach of contract and for the infringement of patents.

3 3. On or about the 3rd day of November 1914, letters patent No. 1115795 were duly issued in the name of the United States of America, under the seal of the Patent Office, and signed by the Commissioner of Patents, to the Claimant, upon his application therefor, for a certain new and useful invention theretofore made by the Claimant for the stabilization and control of airplanes, to wit: the control of the whole equilibrium of the machine by the simple oscillation of a single lever moving in all directions and operated by one hand, which has since become popularly known as the "joy stick." A further and fuller description of the invention therein patented will appear in said patent or a duly authenticated copy thereof here in Court to be produced. This invention was not known or used by others in this country before the Claimant's invention thereof and not patented or described in any printed publication in this or any foreign country, before the Claimant's invention or discovery thereof, or more than two years prior to the Claimant's application and not in public use or on sale in this country for more than two years prior to the Claimant's application. The said patent granted to the Claimant, his heirs or assigns for the term of seventeen years the exclusive right to make, use, and vend the invention covered thereby throughout the United States and the territories thereof. The Claimant and his agents have never made or sold the said patented article in the United States.

4. Thereafter, in June 1917 and continuously since that date and up to the present time, the invention described in and covered by the said patent was used and manufactured by and for the defendant, without license of the owner thereof, the Claimant, or lawful right to use or manufacture the same, in airplanes made and used by and for defendant in large amounts. Such airplanes

4 were manufactured by and for the defendant in the factories of the Curtiss Aeroplane and Motor Corporation, Buffalo, New York; Standard Aircraft Corporation, Elizabeth, New Jersey; Thomas-Morse Aircraft Corporation, Ithaca, New York; Wright-Martin Aircraft Corporation, Los Angeles, California; Sturtevant Aeroplane Company, Boston, Massachusetts; the Burgess Company, Marblehead, Massachusetts; L. W. F. (Lowe, Willard & Fowler) Engineering Company, College Point, Long Island, New York; Aeromarine Engineering & Sales Company, New York, New York; Boeing Airplane Company, Seattle, Washington; Dayton-Wright Airplane Corporation, Dayton, Ohio; Springfield Aircraft Corporation, Springfield, Massachusetts; Packard Motor Car Company, Detroit, Michigan, and other manufacturers in the United States, the total amount of such manufacture from June 1917, until November 11, 1918, being 11,754 airplanes. Further infringing airplanes were

manufactured by and for the defendant in large amounts since November 11, 1918, and up to the present time, the extent of which manufacture the Claimant is unable further to particularize without examining copies of Consolidated Reports in the War, Navy, and Post Office Departments respectively, by years and types, of the airplanes manufactured by and for those departments during the period above named. The Claimant applied for such Consolidated Reports to the War, Navy, and Post Office Departments respectively, but his applications were denied, as appears from the letters attached as exhibits to the motions filed by the Claimant in this Court November 18, 1924, for calls on the said departments for the said information and papers. After such denial by the said departments respectively and on November 13, 1924, the Claimant filed in this Court motions, as referred to above, for calls on the said departments respectively for the said information and papers. The said
5 motions were overruled by this Court November 25, 1924, on the defendant's objections thereto but with no hearing or other reply of the Claimant. The infringing airplanes were used by and for the defendant in the Army and Navy from June 1917 and up to the present time, and in the Post Office Department since May 15, 1918, and up to the present time. On or about the 29th day of November 1920, in Paris, France, the Claimant duly notified the defendant, through its representative, Colonel James J. Mayes, of such infringement, but defendant continued to make and use the patented article of the Claimant to his great damage. The damage caused the Claimant by the aforesaid manufacture and use is a large sum, to wit: One million one hundred seventy-five thousand four hundred dollars ($1,175,400.00), being the fair and reasonable value of a license under the Claimant's said talent for the said manufacture up to November 11, 1918, and use of his invention covered thereby, together with such further sum as will compensate the Claimant for the defendant's infringement in airplanes built since November 11, 1918, and up to the present time, which infringement the Claimant is at present unable further to particularize, as stated above in this paragraph. The above mentioned acts of infringement by and for the defendant give rise to a right of action in the Claimant against the United States in this Court by virtue of the Act of June 25, 1910, Chapter 423 (36 Stat., 851), as amended by the Act of July 1, 1918, Chapter 114 (40 Stat., 704, 705), and by virtue of Section 155 of the Judicial Code and by virtue of the International Convention concluded March 20, 1883 (25 Stat. 1372), as modified by the Additional Act concluded December 14, 1900 (32 Stat. 1936), as revised by the International Convention signed June 2, 1911 (38 Stat. 1645).

5. No action upon the Claimant's claim has been had by or
6 before Congress or any executive department of the Government, except that the Claimant presented his claim to the Secretary of War, who declined to allow it; and the Claimant never brought, nor has pending in any court, any suit or process against

any other person, firm, or corporation acting or professing to act mediately or immediately under the authority of the United States for or in respect of the claim herein presented.

6. The Claimant is the sole owner of this claim and the only person interested therein; and no assignment or transfer of said claim, or of any part thereof or interest therein, has been made.

6A. The Claimant is not and never has been in the employment or service of the Government of the United States.

7. The Claimant is justly entitled to the amount herein claimed from the United States after allowing all just credits and offsets.

8. The Claimant has not in any way voluntarily aided, abetted, or given encouragement to rebellion against the Government of the United States, and he believes the facts as stated herein to be true.

For a Second Cause of Action

Upon Information and Belief

9. The Claimant repeats all the allegations of paragraphs 1 and 2, as fully as if set forth at length herein.

10. On or about the 19th day of December 1906, the 19th day of January 1907, and the 22nd day of January 1907, letters patent Nos. 372753, 373763, and 373818, respectively, were duly issued by the French Republic to the Claimant for certain new and useful improvements in the control and stabilization of airplanes by a lever, as more fully will appear in said patents or duly authen-
7 ticated copies thereof here in Court to be produced. The said patents granted to the Claimant the exclusive right to make, use, and sell the inventions covered thereby throughout the territory of the French Republic.

11. Thereafter, from April 6, 1917, to November 11, 1918, and while said letters patent of the French Republic were in full force and effect, to the knowledge of the defendant, the inventions described in and covered by the said letters patent were used, manufactured, and vended by and for the defendant in the territory of the French Republic in airplanes made, used, and vended by and for the defendant in large amounts, to wit, 5.139 airplanes built for the defendant in France and England, and the defendant agreed to pay and the Claimant agreed to receive a reasonable compensation therefor, to wit, Five hundred thirteen thousand nine hundred dollars ($513,900.00).

12. No part of the said sum has been paid although it was duly demanded by the Claimant of the defendant through its representative, Colonel James J. Mayes, on or about the 29th day of November 1920, in Paris, France, which breach of the aforesaid implied contract gives rise to a right of action in the Claimant against the United States in this Court by virtue of Sections 145 and 155 of the Judicial Code.

13. The Claimant repeats all the allegations of paragraphs 5, 6, 6A, 7, and 8, as fully as if set forth at length herein.

Wherefore the Claimant prays that he may have judgment for One million six hundred eighty-nine thousand three hundred dollars ($1,689,300.00) together with fair compensation for the defendant's infringement in airplanes manufactured from November 11,
8 1918, and up to the present time, with such costs and interest as may be allowed, and to such further relief as may be just.

CADWALADER, WICKERSHAM & TAFT,
Attorneys for Claimant.

[*Duly sworn to by George W. Wickersham; jurat omitted in printing.*]

9 III. *General traverse*

Filed March 22, 1928

And now comes the Assistant Attorney General, on behalf of the United States, and answering the fourth amended petition of the plaintiff herein, denies each and every allegation therein contained; and asks judgment that the fourth amended petition be dismissed.

HERMAN J. GALLOWAY,
Assistant Attorney General.

IV. *Argument and submission of case*

On December 4, 1934, this case was argued and submitted on merits by Messrs. Edwin J. Prindle, George W. Wickersham, and Eugene V. Myers, for plaintiff, and by Mr. Alex. Holtzoff, for defendant.

V. *Further proceedings in case*

On November 4, 1935, the court filed special findings of fact, and conclusion of law, deciding that plaintiff was entitled to recover, but reserved judgment pending the taking of testimony by a commissioner of the court upon the question of reasonable and entire compensation.

Opinion by Booth, Ch. J.

10 On January 13, 1936, the defendant filed a motion to amend the conclusion of law and for entry of an interlocutory judgment.

On January 24, 1936, the court allowed said motion and entered the following order:

ORDER

It is ordered by the court this 24th day of January 1936 that the defendant's motion to amend the conclusion of law and for entry

of interlocutory judgment in the above entitled case be allowed and the conclusion of law is amended to read as follows:

"Upon the foregoing special findings of fact which are made a part of the judgment herein, the court decides as a conclusion of law that the plaintiff's patent is valid and has been infringed by the United States and that he is entitled to compensation therefor under the act of June 25, 1910, 36 Stat. 851, as amended by the act of July 1, 1918, 40 Stat. 705, and Section 155 of the Judicial Code."

11 VI. *Special findings of fact, conclusion of law (as amended by the order of January 24, 1936), and opinion of the court by Booth, Ch. J.*

Messrs. Edwin J. Prindle, George W. Wickersham, and Eugene V. Myers for the plaintiff. Messrs. Arthur C. Fraser and R. Keith Kane, and Cadwalader, Wickersham & Taft were on the briefs.

Mr. Alexander Holtzoff, with whom was Mr. Assistant Attorney General George C. Sweeney, for the defendant.

This case having been heard by the Court of Claims, the court, upon the report of a Commissioner and the evidence, makes the following

Special findings of fact

I

The plaintiff, Robert Esnault-Pelterie, resides at 43 Boulevard Lannes, Paris, France. He is a distinguished inventor and practitioner in the art of aviation, and has always been a citizen and subject of the French Republic.

Plaintiff is the sole owner of the claim herein made and the only person interested therein and has made no assignment or transfer of said claim or any part thereof or any interest therein.

During June 1917 and thereafter up until June 21, 1921, he was at no time in the United States.

Plaintiff is not and never has been in the employment or in the service of the Government of the United States, and has not in any way voluntarily aided or abetted or given encouragement to rebellion against the Government of the United States.

II

The French Republic is a Government which accords to citizens of the United States the right to prosecute claims against such Government in its courts.

III

The plaintiff, Robert Esnault-Pelterie, made application in France for the following French patents:

French patent #372753, applied for December 19, 1906, issued February 28, 1907, and published April 18, 1907.

12 French patent #373763, applied for January 19, 1907, issued March 28, 1907, and published May 27, 1907.

French patent #373818, applied for January 22, 1907, issued March 28, 1907, and published May 28, 1907.

Copies of these patents, defendant's exhibits nos. D–7, D–8, and D–9 are, by reference, made a part of this finding.

IV

The plaintiff's French patent #372753 discloses an airplane having four wings, two of which are mounted forward of the longitudinal center of the machine and the remaining two rearward thereof, the wings being on the same general horizontal plane. Each of these wings is so constructed and mounted as to allow its angle of attack to be altered by rotating it about its longitudinal axis. The pilot's seat is located midway between the front and rear sets of wings. Equilibrium and directional control are obtained by means of two horizontally disposed levers mounted at the pilot's right and left hand, respectively. These levers are universally pivoted at their forward ends, their rear ends being adjacent to the seat of the pilot, and when in normal or neutral position the axes of these levers substantially coincide with the line or path of flight of the plane.

The longitudinal equilibrium of the machine is intended to be controlled by raising or lowering the rearward end of the right-hand lever, the directional response of the machine being of such a nature that when it is desired to nose the machine upward the rear end of the right-hand lever is raised, thereby causing the lever to assume a downward inclination from its end in the hand of the pilot to its point of universal pivotal support. When it is desired to nose the machine downward the operative end of the lever is depressed, thereby causing the lever to assume an opposite or upward inclination. The plane thus assumes an inclination opposite in directional response to the inclination impressed upon the normally horizontal control lever by the pilot or longitudinal equilibrium control.

Transverse equilibrium or rolling is controlled by manipulating the same right-hand lever in a horizontal plane to the right or left. The connections between this lever and the rear wing of the plane are such as to cause the plane to roll to the right when the lever is pushed to the right in a horizontal plane, and vice versa, the plane rolling in the direction in which the rear end of the lever is horizontally moved. An oblique movement of this lever will cause a control of both the longitudinal and transverse equilibrium in a relative degree of combination.

The left-hand lever is so connected with the directional rudder of the plane as to manipulate the same by swinging it in a horizontal plane either to the right or left, the result in directional response not being set forth in the French patent.

The left-hand lever is universally mounted at its forward end and a portion of the same extends beyond the mounting and engages in a slotted cross member connected to the forward end of the right-hand lever. This engagement with the slot functions as a fulcrum for the lever connections when transmitting any vertical component of movement of the right-hand lever to the rear wings.

13 This French patent also discloses means for varying the angle of attack of the front and rear sets of wings in the same degree so as to effect an increase or decrease of elevation without disturbing the longitudinal equilibrium of the machine, the necessity of nosing upward to ascend or downward to descend being eliminated. This is intended to be accomplished by an upward or downward movement of the rear end of the left-hand lever. An upward movement causes a downward inclination of the lever, in turn causing a descent of the plane, and vice versa.

When the left-hand lever is thus manipulated, the forward extension of the right-hand lever serves as a fulcrum point. As the forward ends of both the right and left-hand levers must operate as fulcrum points during certain control manipulations and the levers are thus interconnected, it is essential that the pilot must continuously keep hold of both levers.

There is no evidence that an actual airplane has ever been constructed in accordance with the disclosure of this patent. A model, defendant's exhibit 20, is illustrative of the controlling levers and their connections.

V

The Esnault-Pelterie French patent #373763 discloses an airplane structure subsequently referred to in these findings as of the ring-tail type. This structure is of the monoplane type having deformable wings and vertical and horizontal rudders mounted on a ring at the rear of the fuselage. A left-hand vertical lever gives control for steering the airplane to the right or left, and a right-hand vertical lever universally mounted and movable in all directions controls the pitching and transverse attitude of the airplane.

French patent #373818 is directed to an airplane structure subsequently referred to in these findings as of the bird-tail type. This patent discloses an airplane having deformable wings and a single rear tail surface adapted to support a portion of the weight of the airplane and movable around a longitudinal axis for steering and about a cross axis to cause the airplane to ascend or descend. The steering of the airplane is accomplished by the movement of a vertical left-hand lever, and a right-hand vertical universally mounted lever controls the pitching and transverse attitude of the airplane.

In both of these patents the directional response of the airplane to movements of the right-hand lever or stick is instinctive in direc-

tional character, in that the airplane tilts or inclines in the same direction that the control lever is tilted or inclined.

The disclosures in these two French patents form the basis of the patent in suit.

VI

(a) An airplane using a single vertical lever for the control of both longitudinal and transverse equilibrium, as disclosed in plaintiff's French patents #373763 and #373818, was constructed and flown by the plaintiff in the spring of 1907; numerous successful flights were made. This machine is now a part of a collection in the Conservatoire des Arts de Metiers in Paris.

This machine as constructed follows substantially the embodiment disclosed in French patent #373818. It differed therefrom
14 in that the control rod that connected the right-hand lever to the tail surface was replaced by a cable, an arrangement of yieldable rubber cords being provided between an upper horn on the tail surfaces and a fixed point in the fuselage in order to keep the cable under tension at all times, and thus permit a two-way control effect of the cable at all times.

(b) An article in the publication entitled "Aeronautics", published January 1909, described to the public the controls of the Esnault-Pelterie plane "R. E. P. II-Bis", using in part the following phraseology:

"Left-hand lever, with ball-and-socket joint, stabilizes in every sense by lowering exactly that side of the machine towards which it is pushed. This lever can be moved towards any point of the compass, thus working the horizontal rudder and twisting the wings at the same time to a corresponding degree, or only one performing function. Pushing it ahead sets the horizontal rudder to raise the rear end, pushing it astern to depress the latter. Pushing it to the right gives the right wing, pushing it to the left the left wing at decreased angle of flight, with corresponding increase of the opposite wing's angle. This is certainly the most perfect system thus far of handling controls. It makes flying easy, and brings about a natural reflex action without any thinking being needed, the idea taking at once possession of the mind that any dangerous inclination is immediately remedied by a simple movement of the 'magic wand' in the left hand towards that side, of an amplitude corresponding to the violence of the disturbance. This system is also beneficial in entirely separating the steering process from the stabilizing process as far as mental action goes. Although stabilizing by twisting will necessitate, like in the Wright machine, a corresponding steering movement, the latter, to the mind, will always appear as a part from the stabilizing effort and eliminate confusion."

A photostat copy of this article, plaintiff's exhibit 49, is by reference made a part of this finding.

VII

On December 10, 1907, at Paris, France, plaintiff signed and took oath to an application for United States patent which was forwarded with four sheets of drawings by plaintiff's patent attorney in Paris to his New York attorneys. This application included substantially all of the drawings of plaintiff's three French patents no. 373763, no. 373818, and no. 372753, and the specifications included the substance of the specifications of these three French patents. The oath referred to the same three French patents by dates of filing and numbers. To cover the inventions claimed in all three French patents in one patent in the United States, the United States application should have been filed within 12 months from the filing of the first French application, namely, on December 19, 1907; but the papers reached this country too late for filing within the statutory time limit.

On January 7, 1908, the plaintiff executed at Paris the application for United States patent, which matured into the patent in suit. The oath omitted reference to the French patent applied for December 19, 1906, no. 372753; and the specifications omitted that portion of the description contained in the application first signed, which corresponded to the 1906 French application. The attorneys then filed in the Patent Office on January 16, 1908, the new application papers and the drawings previously received.

The first sheet of the drawings then filed illustrated the construction of plaintiff's French patent of 1906, no. 372753, being identical therewith except that three small views of this French patent were omitted. The second and third sheets of drawings corresponded to the drawings of the plaintiff's second French patent, no. 373763, and his third French patent, no. 373818, respectively. The specification contained no description of the figures of the first sheet of drawings, the description referring only to the figures of the remaining three sheets of the drawings. The fourth sheet of the drawings correspond to the drawings of a certificate of addition of one of the French patents, dated May 4, 1907, and has no materiality herein.

The specifications which formed a part of the application indicated the construction and special features of the airplane both by verbal description and by reference made to the variously numbered drawings accompanying it. Among others were references to such drawings diagrammatically showing the device and operation of the entire control system of the longitudinal and lateral stabilities, and the horizontal direction in substantially the same manner as such control system appears in the patent as granted.

VIII

The claims as filed were as follows:

"1. An aeroplane in which the pairs of distortable wings are each subtended by two stay wires, a front one and a back one, leading from the outer corner to a longitudinal bar fixed at the lower part of a pivoted vertical rod projecting downward under the girder,

which rod, when rotated causes the traction of the front stay wire of one wing and the traction of the back stay wire of the other for controlling the inclination of the fore part of the former and that of the aft part of the latter for obtaining the transverse stability through deformation of the whole system.

"2. An aeroplane in which both directing and ascensional depending rudders are formed of one or two vertical planes pivoted about a vertical axis and of one or two horizontal planes pivoted about an horizontal axis, for producing, the direction and the longitudinal stability as well as the ascent and descent of the machine, the said rudder being capable of cooperating simultaneously with the distortable wings for obtaining the stability of the whole aeroplane.

"3. An aeroplane in which the directing and ascensional rudders are mounted on a ring with ball and socket joint capable of being pivoted about ideal horizontal and vertical axis.

"4. An aeroplane in which the controlling is effected by two separate levers, rigid transmissions for controlling the distortable wings and both rudders.

"5. An aeroplane comprising a screw at the fore end, a single pair of distortable wings and a tail or rudder formed of an horizontal plan with double rotation which may be used both for giving the direction to the machine and for obtaining the longitudinal stability and ascent or descent, the fore pair of distortable wings being used, on the other hand, to resolve the transverse stability.

16 "6. An aeroplane in which the controlling methods of the rear tail forming the rudder is carried into effect by means of two levers symmetrically arranged with reference to the pilot seat, the left-hand lever, for example, causing through a cardan system, the rotation of the rudder about a longitudinal horizontal axis, and the moving of the right-hand lever causing the inclination thereof about a transverse horizontal axis.

"7. An aeroplane with two pairs of distortable wings capable of pivoting about horizontal axis, the distorting of the wings having the effect of allowing of the transverse stability and the transverse inclination of the rear pair of wings to be performed, and of causing the direction of the machine and to set in the desired direction the fore and aft pairs of wings used for resolving the longitudinal stability and the ascent and descent of the machine.

"8. An aeroplane having a very light and sufficiently rigid transverse beam for aeroplane wings, consisting of a number of wooden members suitably cut out and leaving between them spaces for passing the ribs therethrough, and united together by upper and lower flanges riveted thereon and extended on the whole length of the girder, such girder being again characterized by the fact that at the point where the curve is changing the wooden members are replaced by metal members, for example of aluminum, suitably cut out and also riveted to the flanges."

The specifications and the drawings to which they made reference disclosed vertical levers for steering and for equilibrium control

which operated exactly as those described in the patent in suit as granted. Original claim 4 was directed to separate levers for controlling the distortable wings and both rudders, and claim 6 specified in effect that the left-hand lever was for steering and the right-hand lever was for longitudinal stability. The application as filed disclosed the vertical disposition and the instinctiveness of the direction of movement or inclination of the stabilizing or equilibrium control lever. The specification as filed did not make any reference to this lever effecting the movement of the control surfaces in an instinctive direction, nor did the specification as filed contain any claim directed to the novelty of such features.

The examiner of patents on March 10, 1908, made certain technical objections, cited five patents to show the state of the art, and required applicant to supply new drawings which should set forth the mechanism in detail showing its operative parts, certain figures of the original drawings being objected to as being only diagrammatic.

In response thereto, the plaintiff, on February 1, 1909, filed an amendment withdrawing the first sheet of drawings inasmuch as they applied to the 1906 French patent only, added new drawings containing Figs. 1a, 3a, 7a, 8a, and 9a as they appear in the issued patent, and rewrote the specifications. Plaintiff in this amendment made claim to the novelty presented by a single vertical lever for controlling transverse and longitudinal equilibrium, claims 2 and 13 being phrased as follows:

"2. An aeroplane having distortable wings for maintaining transverse stability, a rudder for maintaining longitudinal stability, a lever controlling said wings and said rudder, a steering rudder, and a separate lever controlling said steering rudder."

17 "13. An aeroplane having means for controlling its inclination and a single lever for operating said means to control both the longitudinal and the transverse stability of the apparatus; said lever being arranged to oscillate in different vertical planes, means for transmitting its movement in one plane to the means for governing the longitudinal inclination, and means for transmitting its movement in the other plane to the means for determining the transverse stability, said lever being mounted to permit also an oblique movement having components in each of said planes so as to actuate simultaneously the means for establishing longitudinal stability and that for establishing transverse stability."

The examiner of patents on March 2, 1909, rejected claim 13 for alleged lack of invention over the French patent to Laroze. To this the plaintiff made response asking for a reconsideration of the claim relative to the single control lever. The examiner, on May 10, 1910, and again on May 27, 1911, rejected the claim, this time on the basis of the Davidson as well as the Laroze patent. On May 23, 1912, the plaintiff cancelled this claim and required the insertion of figures 6 and 10 as they appear in the patent drawings, as substitutes for the originally filed figures 11 and 15. On June 12, 1913,

plaintiff filed a new set of claims among which were four appearing exactly as in claims numbered 5, 6, 7, and 8 of the patent in suit.

These were rejected by the examiner June 16, 1913, on the basis of the Davidson, Laroze, Montgomery, and Wright patents. By amendment of June 13, 1914, plaintiff added a claim which appears as claim 9 in the patent in suit.

On June 16, 1914, the claims were allowed and on November 3, 1914, the patent issued. A certified copy of the file wrapper and contents appear in evidence as defendant's exhibit D–1 and is made a part hereof by reference.

No supplemental oath was furnished by the applicant or required by the Patent Office.

IX

On November 3, 1914, Letters Patent No. 1115795 was granted to the plaintiff for an airplane, which patent is hereinafter referred to as the "patent in suit." A copy of this patent which is in evidence as plaintiff's exhibit 1 is by reference made a part of this finding.

The plaintiff's contentions on which this suit for infringement is based are limited to claims 2 and 5 to 9, inclusive, of the patent in suit, which claims are as follows:

"2. An aeroplane having distortable wings for maintaining transverse stability, a rudder for maintaining longitudinal stability, a lever controlling said wings and said rudder, a steering rudder, and a separate lever controlling said steering rudder.

"5. In an areoplane, the combination of means for producing lateral stability, means for producing longitudinal stability, and a single vertical lever movable in every direction for operating both said means for producing lateral stability and said means for producing longitudinal stability.

"6. In an aeroplane, the combination of means for producing lateral stability, means for producing longitudinal stability, means for steering in a horizontal plane, a single vertical lever movable in every direction for operating both said means for producing lateral stability and said means for producing longitudinal stability, and separate means for operating said steering means.

"7. In an aeroplane, the combination of means for producing lateral stability, means for producing longitudinal stability, and a single vertical lever movable in every direction for operating both said means for producing lateral stability and said means for producing longitudinal stability, said single lever being operable by reflex movements of the body of an aviator to restore said areoplane to an even keel when it departs therefrom in either a lateral or longitudinal direction.

"8. In an aeroplane, the combination of means for producing lateral stability, means for producing longitudinal stability, and a single vertical lever movable in every direction operating upon both

said means for producing lateral stability and said means for producing longitudinal stability, said lever, upon forward movement thereof, operating said means for producing longitudinal stability to direct the aeroplane downwardly, said lever, upon rearward movement thereof, operating said means for producing longitudinal stability to elevate the aeroplane, said lever, upon movement thereof to the right and left, operating said means for producing lateral stability to raise the aeroplane on the left and right respectively.

"9. In an aeroplane, the combination of means for producing lateral stability, means for producing longitudinal stability and a single vertical lever for operating both said means for producing lateral stability and said means for producing longitudinal stability, said lever being mounted upon an universal joint and being oscillatable in every direction."

X

An airplane supports itself by the reaction of its wing surfaces against the air through which it travels. This reaction is obtained by the relative movement of the plane with respect to the air, either by force of gravity as when the plane is in a glide or by the use of a propeller and motor as when the plane is in normal flight.

Piloting of an airplane involves two classes of control, to wit, directional control and equilibrium or stability control.

The directional control or horizontal steering is effected by the use of a vertical control surface located generally in the rear of the machine. Its action and function correspond to that of an ordinary rudder by means of which a boat is steered and this control surface is manipulated by the pilot to give proper directional flight to the plane and to correct any yawing of the plane that may occur.

The directional control or rudder control for steering the airplane in a horizontal plane as in directing the course of a ship is not, except in extraordinary circumstances, a critical control. When the airplane is in normal flight, it is immaterial whether the machine flies toward one point of the compass or another so far as its safety is concerned.

Two kinds of equilibrium or attitude control must be exercised, one being that which controls the lateral equilibrium or attitude of the plane and which has to do with the rolling of the machine around its longitudinal axis. The other is that of longitudinal
19 equilibrium or attitude which has to do with the inclination of the longitudinal axis of the plane either downward as in the case when it is descending or upward as when it is ascending.

Longitudinal equilibrium is effected by the use of a control surface or horizontal rudder called an elevator and located generally at the rear of the machine. By varying the angle of attack of this surface the inclination of the airplane is varied and if this elevator surface is so inclined that the rear or tail of the airplane is thrust upwardly, the machine assumes a descending attitude, and vice versa.

Lateral equilibrium is effected by a differential variance in the angle of attack of the wing surfaces or a portion thereof so that there is a resultant decreased lift on the surface or the portion thereof, of one wing with a corresponding increased upward lift on the opposite wing, the result being to cause the plane to roll about its longitudinal axis. Due to unequal air currents, air pockets, etc., lateral instability frequently occurs and the use of this rolling movement is necessary to regain such temporarily lost stability. This rolling movement or banking movement is also of importance when it is desired to turn the machine to the right or left in a horizontal plane by means of rudder or directional control and the turn is sufficiently sharp to bring centrifugal force into play with a consequent skid or side-slip of the plane which causes a dangerous loss of flying speed. This centrifugal force may be offset by rolling or banking the plane by means of the lateral equilibrium control.

When an airplane is rolled or banked the differential drag of the wings will cause the airplane to yaw or deviate from its directional course. The degree of yaw will be dependent upon the extent or angle of roll and also upon the character of structure employed for altering the wing surfaces.

Tests made upon a Waco biplane, a standard light airplane, utilizing ailerons for lateral equilibrium control indicated a three-degree yaw for a fifteen to twenty-degree roll from horizontal.

The cross currents and air pockets in the air are invisible to the pilot and therefore cannot be anticipated. These cause the airplane to be thrown into abnormal attitudes which must be properly and instantly corrected and thereby demands from the pilot a constant ability of instant control to restore the plane to proper equilibrium or attitude and at the same time control its directional movement.

In the flight of an airplane it most frequently occurs that both the longitudinal and lateral equilibriums are simultaneously disturbed, such disturbances commonly involving varying components of both equilibriums, and to compensate directly for such disturbances it is necessary that the airplane shall be tilted in an oblique vertical plane lying between the longitudinal and transverse planes of equilibrium or attitude control. Because the air disturbances through which the airplane passes act at random and at all possible angles, such oblique correction is required in the majority of instances of equilibrium or attitude control.

XI

An airplane may be constructed with a certain amount of transverse and lateral stability inherent in its structure. By constructing the wings with a dihedral angle, a lateral stabilizing tendency is given to the plane, and by providing a horizontal vane or tail surface a longitudinal stabilizing tendency is

imparted to the plane. By virtue of these lateral and longitudinal stabilizing tendencies, a plane in normal flight, when its attitude is disturbed by a gust of air, will of itself tend to regain its normal attitude without any manipulation of the controls by the pilot.

The banking and elevational controls of the plane by means of which the plane may be rolled or banked and nosed up or down, have a superimposed stabilizing tendency upon the plane and are used by the pilot for this purpose: that is to say, if the attitude of a plane in normal flight is disturbed by a gust of wind, the pilot may manipulate these controls and cause them to function in such manner as to stabilize or return the plane as soon as possible to a normal flight attitude, thus superimposing upon whatever inherent stability the plane has, an added stabilizing or equilibrium effect. The banking and elevational controls function respectively as lateral and longitudinal equilibrium controls, sometimes to assist and at other times to oppose whatever inherent stability or equilibrium has been built into the airplane.

XII

Man instinctively attempts to maintain his balance at all times, and if he is moved off balance in any direction he naturally and instinctively effects an opposite mental and muscular response which tends to restore his body to a normal vertical position.

If this natural directional reflex response is utilized in controlling the equilibrium of an airplane in normal flight, a material amount of conscious mental effort on the part of the pilot is eliminated.

An equilibrium control comprising a vertical lever universally mounted at its lower end so as to be capable of movement or inclination in any direction, and which when thus inclined in any vertical plane causes a corresponding movement of the whole airplane, tends to eliminate a material part of the conscious mental effort of the pilot with respect to equilibrium control during normal flight.

This result is due to the obvious relation between the control movement and the resultant effect upon the airplane, so that the pilot knows that any inclination imparted to the control lever in any direction will be followed by a similar directional inclination of the airplane, thus imposing a minimum of conscious mental effort upon the pilot and contributing to an instinctiveness of control of the airplane.

When an airplane assumes certain abnormal attitudes, such as its attitude in a spinning nose dive, the pilot cannot depend solely upon the obvious manipulation of such a lever in accordance with his instinctive or reflex action.

During blind flying (in fog or through clouds) when the pilot has no reference mark such as the horizon, the pilot cannot trust to his balancing instinct to control the airplane but must fly it by means of instruments designed to guide him under these conditions.

Blind flying, which is avoided by the usual pilot if possible, was unheard of at the date of the invention in suit and even today only represents such a small percentage of airplane operation as to be classed abnormal flying.

21 Captain Hegenberger, who has been investigating blind flying for the Government and instructing other pilots in blind flying, has only flown blind 200 hours out of a total of 2,500 flying hours and of the 200 hours 175 hours were flown deliberately or with the intention of investigating blind flying.

A pilot must undergo special training in order to undertake blind flying.

XIII

The patent in suit indicates as its object the construction of an airplane of the monoplane type with one or several pairs of wings which may be deflected or distorted as desired, and provided with rudders or with a tail, the combination of such means having the effect of providing for the control of longitudinal and transverse stability as well as for the desired direction in the ascent and descent of the machine.

Two principal embodiments or modifications are disclosed. The first of these has the steering rudder and the ascensional rudder mounted on an integral ringlike structure at the rear of the plane in such a way that the steering or vertical rudder may be rotated about a vertical axis while the ascentional rudder may be rotated about a transverse horizontal axis. The vertical directional rudder is arranged to be controlled by a vertical lever so placed as to be conveniently grasped by the left hand of the pilot, and the connections of this lever with the directional rudder are such as to steer the airplane to the right when the lever is pushed forward by the pilot and to steer the airplane to the left when the lever is pulled back by the pilot. The general details of this control structure are shown in figure 6 of the patent. Figures 3–a and 1–a are illustrative of this embodiment in its entirety, and figures 16, 17, 18, and 19 are illustrative of some of the details of the mounting of the ascensional and directional rudders.

Battey figure A, plaintiff's exhibit 5, which is by reference made a part of this finding, is illustrative of this embodiment.

The second embodiment or modification is that of an airplane having a single rudder or tail surface which is capable of pivoting about a horizontal longitudinal axis and also about a transverse horizontal axis, this rudder or tail surface possessing the dual functions of both directional and ascensional control. This tail surface is cambered with the concave surface down to function as a lifting surface and normally supports a portion of the load of the plane. As shown in figure 10, this rudder or tail is rotated about the longitudinal axis of the plane to give directional control and this movement of the tail is obtained by means of a vertical lever mounted to be grasped by the

left hand of the pilot. A transverse movement of this lever to the left will incline the rudder surfaces or tail so as to steer the plane to the left. A movement of this lever to the right will steer the plane to the right.

The details of the controls of this embodiment are shown in figure 10, and the plane is shown in figures 7, 8, 7–a, and 8–a. This embodiment is also illustrated by the physical model, defendant's exhibit 22, when arranged with the downwardly projecting horn or rudder post.

22 As disclosed in figure 8–a of the patent drawings, the steering lever is arranged in contiguity to a toothed rack for locking or holding this lever in any desired position, such structure enabling the pilot to free his left hand for other purposes.

In both embodiments the means for controlling the equilibrium comprises a vertical lever adapted to be grasped by the right hand of the pilot. This lever is universally supported or mounted at its lower end as shown in figures 6 and 10 so that the upper end is free to swing either to the right or left or forwardly or backwardly and also to any oblique or intermediate inclination. Through a series of lever arms this control lever is connected to wires which are in turn connected with the wing surfaces in such a manner that a movement of the lever to the right causes a variation in the angle of attack of a portion of the wing surfaces with the result that the machine will roll to the right and if the lever is moved to the left the machine will roll to the left. This lever is also connected with the ascensional or elevator control surfaces at the rear of the plane, which surfaces control the longitudinal equilibrium of the machine. The forward movement of this control lever will cause these surfaces to assume such an inclination as to cause the machine to nose down while the rearward movement of this lever will cause an opposite inclination and nosing up of the machine. If the equilibrium control lever is moved to an inclined position intermediate to positions which it would occupy if moved either in a fore and aft or in a transverse direction, it exerts simultaneously such a controlling action upon both the means for controlling the transverse and the longitudinal equilibrium that the airplane responds with a corresponding directional inclination.

Figure 7–a discloses an upwardly projecting horn or rudder post 82 connected with the equilibrium control lever 86 by means of a control wire or very thin rod 83. This structure is contrary in directional control to figure 10, showing in detail the connections between lever 86 and the rudder, and original figure 15, also showing the control connections, which figure was canceled prior to issuance of the application which matured into the patent in suit.

The connections shown in figure 7–a are also contrary in directional effect to the subject matter defined by claims 7 and 8.

Inter partes tests made at Amityville, N. Y., on July 16, 1931, with a full-sized airplane equipped with a ringtail structure built in accordance with the teachings of the patent in suit, demonstrated that

the disclosures and description contained in the patent in suit are of sufficient fullness to enable one skilled in the art to practice the invention disclosed by the patent in suit, and defined by the phraseology of the claims in suit.

XIV

The second embodiment illustrated and described in the patent in suit possesses but a single controlling surface for both directional and ascensional control. When this surface is rotated about the longitudinal axis of the airplane by the left-hand lever to give directional or steering control, its lifting effect is also varied, thus resulting in a variation of the pitch of the airplane. Conversely, when the right-hand lever of the airplane is operated in this
23 modification, in order to vary the pitch of the airplane, a variation of the steering effect of this surface will be introduced unless this surface is in a neutral or horizontal position. These effects are known as "cross-responses." The presence of such cross-response in this second modification, illustrated and described in the patent in suit, does not impair the operativeness of either of the right or left-hand levers and each lever performs its function regardless of the position of the other lever.

Irrespective of the cross-responses, the pilot may use the left-hand lever to steer the airplane to the right or left and use the right-hand lever to effect a change in either the pitch or transverse attitude of the airplane.

XV

In the first modification described and illustrated in the patent in suit, the steering and pitching surfaces are mounted on a ring member having a ball and socket mounting. As illustrated in figures in the patent in suit, the ball and socket mounting gives to this ring member a limited side swing of about 7 degrees to each side of the vertical.

Side swing of the ring member is also restrained by the fork and pin connections between the control rods, and the ring and the control rods and the actuating levers.

Defendant's physical exhibit 21 is a model illustrative of this modification with the exception that it departs from the disclosure of the patent in suit by providing swivel connections in the control rods, thus eliminating the above-mentioned restraint of side swing.

Such side swing has no utility or purpose, and the specification on page 1, line 27, says with reference to this construction that:

"The steering rudder is vertical and may be rotated about a vertical axis, while the rudder which steers the aeroplane upward or downward (called for convenience the 'ascensional' rudder) and which is horizontal and is integral with the vertical rudder, may be rotated about a transverse horizontal axis in such a way as to secure the longitudinal stability of the machine and allow of the ascent and descent to be effected."

To incorporate a guide in the structure of the airplane to maintain the axis of the steering rudder vertical and the ascensional rudder horizontal as set forth in the specification, as quoted above, is within the province of the skilled mechanic. One form of guide to accomplish this is illustrated by plaintiff's physical exhibit 50, as applied to defendant's exhibit 21.

Without this guide in place a certain amount of cross response is present in the second modification due to the side swing of the ring. Such cross response does not impair the operativeness of either the right or left-hand control levers and each lever performs its function regardless of the position of the other lever. Irrespective of the cross responses, the pilot may use the left-hand lever to steer the airplane to the right or left and use the right-hand lever to effect a change in either the pitch or transverse attitude of the airplane.

With the guide in place and the axis of the steering rudders and ascensional rudders, respectively, maintained in the vertical and horizontal, the amount of cross response is negligible.

24 XVI

On September 23, 1931, the defendant's experts conducted a series of tests in the full-sized wind tunnel maintained by the National Advisory Committee for Aeronautics at Langley Field, Virginia. Plaintiff's counsel and experts and a commissioner of the United States Court of Claims were present at these tests.

There were three series of tests made on a Chance-Vought Corsair airplane to which a modified tail structure had been applied. The three series of tests were as follows:

(a) Tests of the Corsair airplane with a tail structure substantially embodying the bird-tail modification of the patent in suit.

(b) Tests of the Corsair airplane with a substantial embodiment of the ring-tail structure of the patent in suit with the exception that the connections of the control rods to the ring on which the rudders were mounted were of such a nature as to permit free side swing of the ring.

(c) Tests of the Corsair airplane with the ring-tail structure guided so as not to permit a side swing.

These tests qualitatively demonstrated the presence of cross responses in the bird-tail embodiment, as set forth in finding XIV, and in the embodiment of the ring-tail structure with the ring free to swing as set forth in finding XV. They also demonstrated the fact that the cross responses were negligible when the ring-tail structure was restrained to a side swing as set forth in finding XV.

In all of the tests the speed of air through the wind tunnel was approximately 57 miles per hour, while the speed of the airplane motor was 1,550 r. p. m., which would normally drive the airplane in free horizontal flight at a speed of 110 miles per hour. This difference in speed caused the development of a slip stream from the propeller with a high degree of turbulence and spiral distortion,

which caused the controlling surfaces to be subjected to abnormal conditions not present in free flight and thus rendered the tests ineffectual for a quantitative determination of cross responses.

With the exception of neutral position, the tests were made only with extreme displacements of the control levers such as would occur only in landing an airplane or in acrobatic flight. No tests were made to demonstrate the reactions or to measure the reactions the controlling surfaces would be subjected to in normal-flight operation of the airplane.

XVII

On July 16, 1931, plaintiff caused flights to be made with an Aeronca airplane at Amityville, Long Island, N. Y., in the presence of defendant's experts and counsel and the commissioner. The Aeronca airplane had been modified by removing its conventional tail structure and substituting a tail structure of the ring-tail type as disclosed in the patent in suit.

This ring-tail structure was so designed as to be flown either with a guide in place to hold the axes of the vertical and horizontal rudders in vertical and horizontal planes, respectively, or with the ring-tail structure unrestrained to the extent that it had a total side swing of 28 degrees.

25 Flights were made with the ring-tail structure both restrained with the guide and unrestrained. The flights involved taking off and landing and executing banked right and left-hand turns. Such flights demonstrated the operativeness of the ring-tail structure disclosed in the patent, both with the ring-tail restrained and unrestrained, and in each of the flights the pilot used the "joy stick" to operate the equilibrium controls and used the rudder for steering. In all flights the steering and stabilizing levers were mechanically separate and independent and each lever performed its own function regardless of the manipulation of the other lever.

The details of the ring-tail construction are shown in blueprint, plaintiff's exhibit 66, and the Aeronca airplane with the ring-tail construction in place, is shown in the photographs, plaintiff's exhibits 61 to 65, inclusive. These exhibits are by reference made a part of this finding.

XVIII

Minor cross responses are present in all airplane controls. In any conventional airplane if the "joy stick" is so moved as to roll the machine to the left, the machine not only rolls but actually starts to turn to the left. Similarly, if the rudder of a conventional airplane is manipulated so as to cause a turn, the machine will immediately bank or roll.

Any change in speed of the plane varies the effective air pressure upon the control surfaces as the square of the speed, therefore giving different rudder and aileron effects for different speeds of the air-

plane. Many conventional single-motor airplanes are so rugged as to maintain a level position at cruising speed. If the speed is varied, the effect of the slip stream of the propeller becomes different and the plane will have a tendency to roll one way or the other, depending upon whether the engine's speed has been increased or decreased. Such roll may be corrected by proper manipulation of the joy stick.

XIX

One airplane at least of the construction illustrated and described as a Curtiss "JN–4D" was manufactured for and used by the defendant without license or permission from the plaintiff and such manufacture and use occurred within the United States between June 1917 and November 11, 1918.

One airplane at least of the construction illustrated and described as a De Haviland "DH–4B" was manufactured for and used by the defendant without license or permission from the plaintiff and such manufacture and use occurred within the United States after November 11, 1918.

One airplane at least of the construction illustrated and described as a Loening monoplane "M–81" was manufactured for and used by the defendant without license or permission from the plaintiff and such manufacture and use occurred within the United States after November 11, 1918.

XX

No action has been had upon plaintiff's claim for alleged infringement resulting from the construction or use of the above air-
26 planes except that the plaintiff presented his claim to the Secretary of War, who declined to allow it. This claim was presented by a letter dated November 29, 1920, addressed to James J. Mayes, colonel, judge advocate, United States Army, located in Paris, who was then chief requisition officer, R. R. & C. Service.

In this letter plaintiff recited his three French patents, including his prior 1906 patent and his United States patent, alleged infringement on the part of the United States, and asked that arrangements be made for indemnification for his damage. To this letter Colonel Mayes made reply advising that he had transmitted the documents to The Adjutant General of the Army at Washington, D. C. The plaintiff has never brought or has pending in any court any suit or process against any other person, firm, corporation acting or professing to act mediately or immediately under the authority of the United States for or in respect of the said claim.

Neither the plaintiff nor his agent has ever made or sold in the United States the articles described in and covered by the patent in suit.

XXI

The control systems of the Curtiss, De Haviland, and Loening airplanes set forth in finding XIX are shown, respectively, in blue

prints which are plaintiff's exhibit 2, plaintiff's exhibit 3, and plaintiff's exhibit 4, and are by reference made a portion of this finding.

In the Curtiss "JN–4D" the controlling mechanism for the directional rudder comprises a centrally pivoted horizontal rudder bar or lever situated directly in front of the pilot and in position for actuation by the pilot's feet. This structure is shown in plaintiff's exhibit 5, Battey figure D, which is by reference made a part of this finding. The ends of the rudder bar are connected by cables to the directional rudder in such a manner that when the pilot actuates the same with his foot against the right end of the lever the airplane is directed toward the right, a push on the left end of the lever resulting in an opposite directional movement.

The means for controlling the transverse and longitudinal equilibrium or pitch and roll of the airplane comprises a vertical lever, known as the "joy stick", universally mounted at its lower end in position in front of the pilot so that its upper end may be conveniently grasped with either hand. This is shown in plaintiff's exhibit 5, Battey figure C, which is by reference made a part of this finding. The universal action of this lever is had by mounting the same on a shaft so that it is free to be swung to the right or left, the lever also being pivoted to the shaft so that it is free to rock in a fore-and-aft direction. This mounting gives the lever a universal movement. Through an arrangement of pulleys and cables the effect of the movement of the lever to the right causes a variance in the angle of attack of a hinged portion of the winged surfaces so that the right wing as a whole drops and the left wing rises, the machine therefore rolling to the right. A corresponding movement of the lever to the left causes a reverse movement of the hinged portion of the two winged surfaces known as ailerons so that the machine rolls to the left.

The "joy stick" or vertical lever is connected with the horizontal control surfaces at the rear or tail of the airplane, which
27 controls its longitudinal equilibrium in such a manner that when this lever is pushed forward the control surfaces are so manipulated as to cause a downward movement of the rear edge of the elevator surface, which in turn results in the downward inclination of the machine. A movement of the lever to the rear produces an opposite effect on the elevator surface, causing the machine to nose up or to assume an upward inclination. When the "joy stick", or equilibrium control lever, is moved in any intermediate position, a consequent movement of the airplane will be produced corresponding relatively to the degree of inclination and the direction of movement of the lever.

The direction and equilibrium controlling means and their connections to the controlling surfaces are illustrated in the model of the Curtiss "JN–4D", defendant's exhibit 23.

In the De Haviland "DH–4B" airplane the means for controlling the directional rudder is identical with that in the Curtiss airplane. The equilibrium control of the De Haviland airplane is illustrated in

plaintiff's exhibit 5, Battey figure F, which is by reference made a part of this finding. This structure is functionally the same as that of the Curtiss "JN–4D" and is also substantially similar in constructional details.

It comprises a single vertical control lever, or "joy stick", universally mounted at its lower end so as to swing forwardly and rearwardly and transversely, or in any intermediate vertical plane, the same being so connected with the controlling surfaces as to cause the machine to nose down when the lever is forwardly inclined, nose up when the lever is backwardly inclined, roll to the right when the lever is inclined to the right, roll to the left when inclined to the left, or to respond to any combination of these movements when the lever is placed in intermediate positions.

In the Loening monoplane "M–81" the action of the horizontal rudder bar or lever and the vertical equilibrium control lever and the resulting effect of their action upon the control of the machine is identical with that indicated in connection with the Curtiss and De Haviland airplanes. The Loening structure is illustrated in plaintiff's exhibit 5, Battey figures G and D, which are by reference made a portion of this finding.

XXII

Each of the three airplanes referred to in finding XIX has wings, a portion of which is hinged so that the contour of the wing surface may be altered and the angle of attack changed for the purpose of controlling the roll or transverse equilibrium of the airplane. The three airplanes also have a rudder pivoted on a horizontal axis for controlling the longitudinal equilibrium or pitch of the airplane.

The means for controlling the wing surfaces and the horizontally pivoted rudder, and thus controlling the lateral and longitudinal equilibrium of the three airplanes, comprise a vertical lever universally mounted at its lower end with the upper end movable in any direction. In normal flight the direction of angular inclination of the vertically mounted equilibrium control lever in the three airplanes, set forth in finding XIX, causes the airplane to tilt in the same direction, and the response of the airplane is thus in accord with the instinctive balancing sensations of the pilot.

28 The foot-actuated rudder bar functions as a separate lever for controlling the steering or vertical rudder. In each of the three airplanes set forth in finding XIX the universally mounted vertical lever is so connected with the controlling surface of the airplanes that when the lever is moved rearwardly the airplane is nosed up; when the lever is moved forwardly the airplane is nosed down; when the lever is moved to the right the airplane rolls to the right; when the lever is moved to the left the airplane rolls to the left.

The three airplanes referred to in finding XIX differ structurally from the specific embodiments illustrated in the patent in suit in

that they employ a horizontal foot-control lever for controlling the directional steering of the airplane in a horizontal plane, whereas in the illustrated embodiments of the patent in suit such means is disclosed as a vertical lever so positioned as to be manipulated by the pilot's left hand.

The mechanical connections between the levers and the control surfaces are also different in structural details from those shown in the embodiments illustrated and described in the patent in suit.

The equilibrium control lever or joy stick of the three airplanes has the same controlling functions as the equilibrium control lever of the patent in suit.

XXVIII

It has been stipulated between the parties that proof of any airplanes having been manufactured for or used by the defendant other than those airplanes set forth in finding XIX and of any damage alleged to have resulted to plaintiff might be deferred until after the adjudication has been had by the Court of Claims as to the validity of the patent in suit and as to infringement thereof by the airplanes set forth in finding XIX.

XXIV

Prior to the plaintiff's alleged date of invention covered by the patent in suit, the following patents and publications were available to the public:

French patent to Penaud and Gauchot, #111574, dated February 18, 1876.

British patent to Davidson, #13700, of 1898.

French patent to Macedo, #290488, dated July 3, 1899.

French patent to Laroze, #356842, dated June 30, 1905.

German patent to Schussler, #85326, date issued February 27, 1896.

German patent to Jung, #129146, date issued March 20, 1902.

United States patent to Wright, #821393, date issued May 22, 1906.

United States patent to Wadsworth, #213079, date issued March 11, 1879.

United States patent to Weeber, #704156, date issued July 8, 1902.

United States patent to Hartness, #168486, date issued October 5, 1875.

British patent to Quentin, #3872, of 1892.

British patent to Wilson, #20022, of 1889.

Publication entitled "Report on the Status of the Experiments with a Dragon Flier", published in Germany, January 1901, by W. Kress.

29 Publication entitled "How the Bird Flies and How Man Will Fly", published in Aviatik Vienna, 1905, by Wilhelm Kress.

Copies of these patents and publications, together with translations, have been introduced in evidence as defendant's exhibits nos. D–3,

D–4, D–12, D–5, D–6, D–7, D–27, D–28, D–112, D–113, D–114, D–115, D–121a, D–121b, D–122a, D–122b, and plaintiff's exhibit no. 50, respectively, and are by reference made a part of this finding.

XXV

The Penaud and Gauchot patent of 1876 discloses an airplane having a vertical rudder for controlling the direction or steering of the machine in a horizontal plane and a horizontal or ascensional rudder for controlling the longitudinal equilibrium. It does not disclose any adjustable means for controlling the lateral equilibrium or stability. In the structure disclosed in this patent the pilot manipulates the vertical and horizontal rudders through a control structure comprising a horizontal transverse bar mounted on a vertical column or rod in front of him and resembling the steering bar and steering column of a bicycle. The horizontal or ascensional rudder is manipulated by a pushing and pulling movement upon the bar and rod as an entirety, and the vertical rudder is controlled by a turning movement of the handlebar about the vertical axis passing through its middle. The patent discloses a directional response in a horizontal plane similar to that of a bicycle when the handlebar is turned, but the directional response present when the vertical column is pushed forward or pulled backward to manipulate the horizontal rudder is not indicated. The use of both hands would be required to operate these two controls. There is no evidence to show that a machine was ever constructed or operated in accordance with this disclosure.

The Penaud and Gauchot patent (1) does not disclose any mechanism by which the transverse equilibrium can be voluntarily controlled; (2) it discloses the controls of the longitudinal equilibrium and the horizontal steering united in a single device instead of being separate; (3) it requires that both hands must be necessarily employed to control either the longitudinal equilibrium or the horizontal steering; (4) it gives no indication to a man skilled in the art as to whether the response of the airplane from the manipulation of the horizontal rudder is in the same angular direction as the inclination of the vertical column controlling this rudder.

XXVI

The Davidson patent of 1898 cited by the Patent Office during the prosecution of the application which matured into the patent in suit, discloses an airplane having a controlling tail surface composed of three parts. The two side parts are movable on horizontal longitudinal axes, and the central part is pivoted to a horizontal transverse axis. The equilibrium control comprises a pendulum universally mounted at its upper end, and sufficiently weighted at its lower end to have the tendency to assume a constant vertical position. This pendulum is connected to two motors, one of which acts on the tail surface to control transverse equilibrium and the other

of which acts on the tail surfaces to control longitudinal equilibrium. If the plane rolls to the right or left or noses up or down, the inclination of the pendulum to the plane structure sets the corresponding motor or motors in operation so that the resulting action on the control surfaces will automatically restore the equilibrium of the plane.

There is no disclosure of any means or mechanism by which the pilot may manually control the stability of the plane and the mechanism shown would not suitably accomplish this object, as the automatic action of the pendulum is intended to respond solely to the force of gravity and does not take into account inertial and centrifugal force which would have important and disturbing effects were an attempt made to utilize this structure. There is no evidence that this mechanism as disclosed was ever employed in any airplane.

The controls in the Davidson patent differ from those claimed by the patent in suit in that (1) they are automatic instead of manual; (2) the controlling movements disclosed would be inoperative to obtain the required results due to the disturbing effects of inertial and centrifugal forces.

XXVII

The French patent to Macedo discloses a glider plane adapted to be raised in the air by means of a captive balloon, subsequently released and gliding to the location of the next captive balloon where it is again raised and the performance repeated. The plane disclosed has a horizontal or ascensional rudder for controlling the longitudinal stability or equilibrium which is controlled by a foot lever the top of which when pushed forward results in the raising of the rear end of the horizontal rudder, causing the machine to rise, and vice versa. The control of the transverse equilibrium and steering mechanism is accomplished by the movement of a single control lever which is vertically mounted so as to move freely in a fore-and-aft direction and which has mounted on it a transverse bar similar to the handlebar of a bicycle. To cause the machine to roll to the left the pilot pushes the vertical lever forward, and for a right roll pulls the vertical lever back. To steer the machine to the right the pilot turns the handlebar arrangement counterclockwise or opposite to the direction employed in steering a bicycle. In order to properly manipulate the transverse equilibrium and directional control, it is necessary for the pilot to grasp the handlebar with both hands.

There is no evidence that a machine was ever constructed in accordance with the disclosure of this patent.

The system of controls disclosed in the Macedo patent differs from that defined by the phraseology of the claims of the patent in suit in that: (1) the longitudinal equilibrium control is operated by a foot lever instead of a vertical lever adapted for operation by the hand of the pilot; (2) the movement of the longitudinal equilibrium

control is in the opposite angular sense from the response of the machine; (3) the transverse equilibrium control is united with the horizontal steering control, the movement of the hand-operated vertical lever being in a plane at right angles to the plane of the resulting response of the machine: (4) the lateral equilibrium control
31 and the steering control are connected and dependent, whereas in the invention as disclosed by the patent in suit they are separate and independent.

XXVIII

The Laroze patent of 1905, which was cited by the Patent Office during the prosecution of the application which materialized into the patent in suit, discloses an airplane provided with a vertical control column which can be swung in a fore-and-aft direction and which can also be rotated about its own vertical axis. On the top of this column there is mounted in a normally vertical transverse plane a control wheel. The connections between this control wheel and the means for controlling the longitudinal and transverse equilibrium of the machine and also the directional rudder are such that the various responses of the machine would occur upon the several possible movements as herein set forth, viz, the transverse equilibrium of the machine is controlled by swinging the wheel and thereby rotating the column on which the wheel is mounted about a vertical axis. The wheel is thus bodily swung about its vertical axis and with the pilot's hands at the right and left-hand side of the wheel, respectively, the controlling movement would be similar to that of turning the handlebar of a bicycle. The mechanical connections to the controlling surfaces are such that turning the wheel and column on which it is mounted clockwise in a horizontal plane causes the machine to roll to the left, and vice versa. The longitudinal equilibrium of the machine is controlled by pushing the wheel bodily forward or pulling it rearward. This causes the column to swing in a fore-and-aft plane, which motion is transmitted to the control surfaces upon which forwardly inclining the column and control wheel the machine would be caused to nose up, and vice versa.

The directional rudder for steering in a horizontal plane is controlled by turning the wheel about its own horizontal axis like the steering wheel of a ship. The connections between this control wheel and the directional rudder are so arranged that turning the wheel clockwise in a vertical plane causes the machine to turn counterclockwise in a horizontal plane, and vice versa. It is necessary at all times for the pilot to grasp the wheel with both hands in order to obtain the desired response. There is no evidence that a machine was ever constructed in accordance with the disclosure of this patent.

The controls in the Laroze patent differ from those defined by the phraseology of the claims in the patent in suit in that (1) the transverse equilibrium is controlled by swinging the wheel in a horizontal plane causing the response of the machine to occur in a vertical

transverse plane; (2) the longitudinal equilibrium is controlled by moving the wheel and column in an opposite sense to the angular direction of response of the machine; (3) the steering means is connected with and mounted upon the equilibrium controlling means.

XXIX

German patent to Schussler, no. 85326, was issued February 27, 1896. This patent which dates from a period prior to the operation of any power-driven airplane illustrates an aerial row-
32 boat construction in which the pilot is suspended in a cage under an umbrellalike wing. The cage or platform upon which the aviator sits is connected to the wing by means of a universal joint construction and the wing is provided with a rigid dependent steering rod which is intended to be grasped by the hands of the aviator, who sits in the suspended frame or cage. The device is intended to be propelled by two lateral projecting oars HH. These oars are manipulated by the feet of the aviator by means of foot pedals and are connected to the foot pedal in such a manner that when the aviator's feet are stretched out the oar surfaces will be vertical while when he draws his feet up they are horizontal in order to offer the least possible resistance. The dependent steering rod is intended to give the sail or supporting surface any desired inclination in relation to the frame for the purpose of giving to the sail " the proper position for the momentary direction of flight."

There is no satisfactory evidence that this device would operate in any other manner than a parachute, or that the aviator, by pushing or pulling on the dependent steering rod which is rigid with respect to the wing or supporting surface, would do more than shift his weight so as to change the position of the general center of gravity. There is no evidence that a machine was ever constructed or operated in accordance with this disclosure.

XXX

German patent to Jung, issued March 20, 1902, discloses an airplane apparently in the nature of a glider but intended to be propelled by the muscular action of the aviator who lies prone and operates a pair of triangular wings or oars by a kicking motion of his feet. The disclosure shows a structure with a nearly horizontal supporting wing having in front a movable elevator which can be tilted by the flier by means of a dependent swinging lever actuated by a cross bar at the lower end held in his hands. When pushed forward the rear end of the elevator will be raised and will tend to cause the machine to nose downward, and vice versa. No means is disclosed for steering in the horizontal plane or controlling the transverse equilibrium.

There is no evidence that a machine was ever constructed in accordance with this disclosure.

XXXI

The patent to Wright, no. 821393, issued May 22, 1906, discloses a transverse equilibrium control comprising a cradle located upon the lower wing of a biplane structure. The aviator or operator lies in a prone position on the wing and by moving his body to the right or left shifts the cradle. The movement of the cradle to the right alters the angle of attack of the wing surfaces in such a manner that the plane rolls to the right, and vice versa.

The cradle is also connected to the directional rudder at the rear of the plane so that the rudder is also manipulated and is swung to the side on which the edges of the wings present the least angle of resistance. Longitudinal equilibrium is maintained by means
33 of a horizontal rudder or vane located in front of the main surfaces. This surface is operated by means of a roller located in front of the pilot and adapted for manual operation.

XXXII

United States patent to Wadsworth, #213079, issued March 11, 1879, discloses a single vertical lever mounted on a universal joint and actuating one mechanism or engine by a motion in one plane and actuating a second mechanism or engine by a motion in another plane at right angles to the first plane. By an oblique or diagonal motion of the lever both mechanisms are capable of simultaneous actuation. The engines mentioned in the patent are the steering engine and the driving engine of a steam vessel or traction engine. Movement in one direction would control the propelling engine, and movement in the plane at right angles thereto would control the steering engine. No mention is made in the patent of its application to aviation or to equilibrium control of an airplane.

XXXIII

United States patent to Weeber, #704156, issued July 8, 1902, discloses a single universally mounted lever for controlling the steering and the braking devices for automobiles. The end of the lever is adjacent the driver's seat and when swung to the right or to the left, the lever actuates a shaft which steers the automobile to the right or to the left. By moving the lever fore or aft the braking mechanism is applied or disengaged. No mention is made of the use of this device in connection with the equilibrium controls of an airplane.

XXXIV

United States patent to Hartness, #168486, issued October 5, 1875, discloses a car or boat attachment for balloons. Its disclosure shows a suspended car for a dirigible balloon. At the rear of the car is mounted an integral elevational and steering rudder which is carried on a universal lever mounted on a universal or a cardan

joint. The lever projects horizontally forward of this joint. In order to operate the elevational rudder the forward end of the lever is moved up or down, and to operate the steering rudder it is moved from side to side. The direction of the response is contrary to the angular inclination of the horizontal lever. The patent does not disclose any lateral stabilizing means.

This patent was considered by the United States Patent Office during the prosecution of the Esnault-Pelterie application which matured into the patent in suit.

XXXV

British patent to Quentin, #3872, of 1892, discloses a flying machine having two superposed surfaces or planes which are alternately or oppositely reciprocated or flapped. The surfaces have blades or shutter which in the upward movement open and in the downward movement close, the surfaces thereby tending to lift or pull the machine into the air.

34 The car is suspended by stays or shrouds and a vertically mounted control lever capable of tilting or inclining in all directions is so connected to the stays or shrouds as to shift the center of gravity of the car with respect to the lifting planes or surfaces so as to cause their propulsive effect to act obliquely and to thus steer the car in a direction in which the lever is inclined. There are no means disclosed in the patent for producing or controlling longitudinal or lateral stability.

XXXVI

British patent to Wilson, #20022, of 1889, shows a horizontally mounted lever closing and opening electric circuits as it is swung up and down. The post on which the lever is mounted is self-arranged to turn on a vertical axis so that when the lever is moved horizontally a second set of electric circuits is opened and closed. This device is stated to be for the remote control of searchlights, guns, telescopes, and the like. The lever when displaced from a neutral position operates the electric contacts to set in motion electrical motors which cause a movement of the control device. When the control lever is brought back to its neutral position the controlled device remains stationary in the position to which it has been moved, and to return the controlled device to its original position the lever must be moved to the opposite side of its neutral position. There is no fixed relationship between any given position of the control lever and the position of the device controlled by it.

The Wilson patent contains no reference to aviation.

XXXVII

United States patent to Simpson, #909468, was issued January 12, 1909, on an application filed in the United States Patent Office Janu-

ary 14, 1907. A copy of this patent, defendant's exhibit D–148, is by reference made a part of this finding.

This patent discloses a hydroplane boat, the hull of which is formed of two parallel pontoons which float on the water and are lifted therefrom by three submerged dependent hydroplane surfaces one of which is located in front and two at the rear. These hydroplane surfaces are carried on lever arms pivoted to the hull. Cables are attached to the lever arms and lead to a drum located at the lower end of a vertical lever or column, the top of which is provided with a wheel. When the wheel is turned the cables are wound about or released from the drum. In order to simultaneously vary the angle of incidence of the three hydroplane surfaces, the pilot by turning the wheel controls the lifting effect of the hydroplane surfaces whenever the boat rises too high or falls too low. The vertical shaft rotates in a sleeve mounted in gimbal joints so that the shaft may be tilted in any direction by bodily moving the handwheel. The pilot by pushing the wheel forward and thus tilting the shaft increases the incidence of the front of the hydroplane and decreases the incidence of the rear of the hydroplane, thus causing the boat to incline upward at the bow. The tilting of the shaft to the right increases the incidence of the right hydroplane and decreases the incidence of the left hydroplane, thereby causing the boat to roll toward the left, and vice versa. The tilting of the shaft in any given direction causes the boat to rise on the side toward which the shaft is tilted, and the angular response thus described is contrary to the direction of angular response disclosed in the equilibrium controlling mechanism of the patent in suit and described in the claims.

XXXVIII

Certain French airplanes manufactured by Bleriot and Farman in France were brought to this country in 1910 and 1911, and were used in exhibition flights. Following these exhibitions some airplanes were built in this country embodying the control wings used on the French airplanes.

The control means included a single-stick control comprising a single vertical lever universally mounted for the longitudinal and lateral control of airplanes, the controls being responsive from such a direction that the tilt of the airplane followed the tilt of the control stick.

There is no satisfactory evidence that any of these said airplanes were in existence in the United States at any time while the Esnault-Pelterie application, which matured into the patent in suit, did not contain either claim 12 or 13 introduced February 1, 1909, and canceled on May 23, 1912, or the later substituted claims filed on June 12, 1913, which substituted claims subsequently became claims 5 to 9, inclusive, of the patent in suit.

XXXIX

Two types of control were in public use on airplanes in the United States in 1912. They were the Wright and Curtiss and are illustrated in plaintiff's exhibits 14 and 15 which are by reference made a part of this finding.

The Wright controls consisted of two vertical levers mounted adjacent the pilot's seat and adapted to be grasped at their top ends by his right and left hand, respectively. The right-hand lever was mounted to swing fore and aft in the direction of flight and carried at its top a small tilting lever mounted to swing transversely to the right and left. The pilot by grasping the small tilting lever and swinging it to the right caused the airplane to steer horizontally to the right, and vice versa. Moving the right-hand lever forward caused the machine to roll to the left and inversely.

The left-hand vertical lever controlled the elevation and depression of the machine. When pushed forward the machine was caused to nose downward, and vice versa.

In the Curtiss machine lateral stability or equilibrium was controlled by means of a shoulder yoke mounted on the back of the pilot's seat and strapped to the pilot's body. If the pilot leaned to the right the machine rolled to the right and vice versa, this mechanism, so far as transverse equilibrium was concerned, having directional response in accord with the instinctive motions of the pilot's body. Steering was accomplished by means of a wheel mounted on a control column in front of the pilot's feet. By turning the wheel clockwise the machine steered to the right, and vice versa. By pushing the column forward the machine was made to nose downward, and vice versa. The shoulder yoke and the vertical control column comprised two separate means for controlling the transverse and longitudinal equilibrium, respectively.

36 XL

Captain Ferber of the French Army conducted certain aeronautical experiments with gliders and airplanes from 1902 to 1906. These experiments were carried on at Nice, France, until 1904, and then at an army post at Chalais-Meudon, France.

Prior to Esnault-Peleterie's French application for patent filed January 19 and January 22, 1907, which matured into French patents nos. 373763 and 373818, two printed publications were issued in France by Captain Ferber, as follows: "The Progress of Aviation since 1901 by Gliding Planes, published 1904," and "The Progress of Aviation by Gliding Planes—Step by Step, Jump by Jump, Flight by Flight, published 1906." Copies of these, defendant's exhibits D–68a and D–68b, are by reference made a part of this finding.

These publications show and describe biplanes having a front elevator. Triangular "focs" or jibs are located in the opposite extremi-

ties of one of the plane surfaces. These are mounted to turn on a vertical axis and when so turned functioned to increase the resistance of that end of the plane thereby having a directional steering or turning function.

The means whereby these "focs" were turned or controlled is not shown or described in these publications.

There is no disclosure in these publications of the operating means for controlling the longitudinal or lateral equilibrium of the airplanes.

XLI

Captain Ferber's first experimental airplanes had either one or two horizontally mounted rods which were pushed or pulled in the direction of their axes for operating the elevator to cause the plane to nose up or down and were swung from side to side to operate the "focs" or jibs for steering the plane. Such planes were constructed in 1904.

In 1905 the jibs were no longer mounted vertically but pivoted on axes of about 45 degrees. The result of this change was that the jibs functioned not only as rudders but also as ailerons so as to introduce a lateral equilibrium control, combined with steering control.

In the spring of 1905 Captain Ferber constructed an experimental machine in which the horizontal control levers were replaced by a three-sided rectangular frame erected in a vertical position, flexible joints permitting this frame to be twisted or moved in any direction. Control was effected by the pilot grasping the lower horizontal bar of the frame and moving the same forward or backward to ascend or descend, and moving it axially to the right or left to turn and bank the airplane.

This machine was rebuilt in the latter part of 1905 and a closed rectangular frame substituted for the three-sided frame. The elevator was controlled by the fore and aft motion of the frame and the jibs or ailerons were controlled by a transverse motion or working of the frame. Still another machine was built by Ferber at Chalais-Meudon in 1906 in which a vertical frame was likewise used to operate the controls, except that the ailerons were actuated by moving the upright members of the frame alternately fore and aft.

37 There is no evidence that any of these airplanes had steering means separate and distinct from lateral equilibrium controlling means.

There is no evidence that any of these experimental machines are in existence, and no contemporaneous photographs or drawings disclosing details of connection of the controls are in existence.

There is no evidence that Captain Ferber made application for a patent earlier than July 19, 1907, at which time he filed a patent application in France entitled "Arrangement for control of the rudders of an airplane."

The army post at Chalais-Meudon was not open to the general public. A permit had to be obtained from the commanding officer in order to obtain access thereto.

There is no evidence that the plaintiff, Robert Esnault-Pelterie, ever witnessed any of Captain Ferber's tests, or ever saw any of his airplanes, or obtained any knowledge of his equilibrium controlling or steering-control means prior to January 19, 1907.

XLII

In 1911 Esnault-Pelterie was commencing a series of suits in France based upon his French patents, and through his patent attorneys, Armengaud Jeme et Fils, notified Louis Bleriot, an experimenter and manufacturer of airplanes, of alleged infringement of his French patents.

Bleriot directed the attention of Marcel Armengaud of the fact that in 1901–1903 he had constructed a flying machine of the flapping wing type, which had a control system including a horizontal lever mounted on a universal joint at the rear of the pilot, the forward lever adjacent the pilot being provided with a pair of handlebars or forks which projected forward on either side of the pilot. This lever was connected to a control element comprising an integral horizontal and vertical rudder.

XLIII

A translation of a letter written to Armengaud on February 10, 1911, by P. A. Vautrin, who constructed this airplane for Bleriot, reads as follows:

"Monsieur Armengaud:

"I saw Mr. Bleriot last Saturday. He asked me if I could remember the control (gouvernail) of the flapping wing airplane that I constructed at his place, rue Duret, 14 or 16, about 1901, '02, or '03. I do not remember exactly, and to write to you on this subject. Yes, sir; Mr. Bleriot and I studied this double control, direction, and height (profondeur), and I constructed myself, helped by several companion mechanics, rue Duret, about the date above stated.

"Enclosed is a diagram of this control.

"The aviator, facing forward in the direction of the arrow, is placed between the two handles of the control of the rudder, which makes only one piece with four arms, *a b c d*, and the frame *e* articulated at *f* and *g* to the cross piece *h*. The cross piece *h*, of which the rectangular frame gives to it a great deal of amplitude, is articulated at *i j* to the fork *k* fixed to the tubular frame. The arms *a b c d* are
respectively and constantly situated in the prolongation of
38 the axes *f j g i* which intersect at the point *o*. At the extremity of the tube *l* mounted in a sleeve of the fork *k* is fixed a second cardan (universal joint) similar to the first, controlled by the latter by means of wires *m n o p*. It is useless to make the de-

scription of this second cardan which resembles almost exactly the first one.

"The rudder properly called is mounted in the sleeve q, Fig. 1 and Fig. 3. The rigidity of its axis (a tube) is augmented by the action of the pulling wires connected respectively to the ends of the arms a' b' c' d' at the extremities of the cross pieces of the rudder a^2 b^2 c^2 d^2.

"Figure 2 represents the two cross pieces h and h', and Figure 3 the rudder, the sleeve in which it is mounted and the four arms, the whole making only one sole piece.

"If one wishes to control in height (profondeur) for rising for example, one presses down on the handles. The contrary if one wishes to descend. If one wishes to control in direction, to the right, one pushes the handles to the left. If one wishes to control in height for rising and in direction to the right, one presses down on the handles obliquely to the left. In a word one carriers the handles to the side opposite to that one wishes to go.

"One is obliged to employ these two cardans, being given the distance which separates the aviator from the rudder."

The sketch which accompanies the letter and which is entitled "Rudder with Two Objects—Direction and Elevation", is illustrated herewith:

39 XLIV

As a result of the disclosure referred to in findings XLII and XLIII, an agreement was prepared and signed by Esnault-Pelterie and Bleriot under date of November 1, 1911.

The agreement in its preamble recites plaintiff's French patents of December 1906 and January 1907 and certain French patents of Bleriot applied for February 9, 1907, and April 26, 1907. The preamble continues as follows:

"In consequence of claims made by Mr. Esnault-Pelterie against Mr. Bleriot, relative to his single bell lever, Mr. Bleriot has been able to prove to Mr. Esnault-Pelterie that he was in prior, legitimate, and personal possession of the invention—that is to say, of the single lever mounted on a cardan joint—by proofs accepted by Mr. Esnault-Pelterie.

"Under these circumstances the two parties have decided to conclude an arrangement consisting in putting in common their French patents in order to reciprocally enforce the rights thereto attached which secure to them the ownership of the single lever control of the organs of stabilization in airplanes, and they have entered into the present agreement."

Articles III and IV of this agreement are as follows:

"Article III

"By reason of the legitimate and prior possession strictly limited to the person of Mr. Bleriot, the latter will be able to provide his

machines with his arrangement of single bell lever without paying any royalty to Mr. Esnault-Pelterie, or, in other words, he will have the free use of his invention for all the levers with which his apparatus shall be provided and for all those that he will furnish directly to the private industry.

"Article IV

"By reason of this circumstance that the patents of Mr. Esnault-Pelterie are all prior to the patents of Mr. Bleriot, the latter engages himself to pay to Mr. Esnault-Peltrie half of the amount of the royalties that he will receive from his existing and future licensees for the single bell levers mounted in cardan (universal joint)."

A translation of this agreement, defendant's exhibit D–32b, is by reference made a part of this finding.

XLV

The expression "in prior, legitimate, and personal possession of the invention" is a phrase peculiar to the French patent law. It indicates a secret possession or knowledge legitimately obtained of a patented invention prior to the application for a patent.

XLVI

The disclosure in the Vautrin sketch relates solely to an elevational and directional rudder; lateral equilibrium control is not disclosed. The directional response accomplished by the mechanism shown in the sketch is contrainstinctive in character in that raising the handlebar depresses the elevational rudder and would cause the machine to nose down and moving the handlebar to either side would swing the directional rudder to the opposite side and thereby steer the machine in a direction opposite to the movement of the handlebar. The sketch does not disclose a vertical lever for operating both longitudinal and transverse stabilizing means so connected to the controlling surfaces that the tilt of the airplane will follow the tilt of the lever.

XLVII

The control system in which a universally pivoted vertical lever is utilized for controlling the two equilibria of the airplane so connected that the tilt of the airplane follows the tilt of the stick and in which sysem the horizontal steering is accomplished by a foot lever, has been widely adopted in France and in the United States. The greater part of all machines used by the French Government during the World War, including several thousand manufactured by the plaintiff, employed this system, it being one of the two control systems which were accepted as standard controls by the French Government for its service planes. This system was used almost uni-

versally in the training planes adopted by the United States Government during the World War. This control system is one of the two standard controls in use by both the Army and Navy of the United States at the present time, and is generally employed in all but the heavier types of machines, which, because of their comparative size and weight, require a greater controlling force than can be conveniently applied by a pilot to a simple vertical lever.

This system of control is the most satisfactory control ever had from the standpoint of training and from the standpoint of the minimum amount of attention required.

Conclusion of law

Upon the foregoing special findings of fact, which are made a part of the judgment herein, the court decides as a conclusion of law that the plaintiff's patent is valid and has been infringed by the United States and that he is entitled to compensation therefor under the act of June 25, 1910, 36 Stat. 851, as amended by the act of July 1, 1918, 40 Stat. 705, and Section 155 of the Judicial Code.

Opinion

BOOTH, Chief Justice, delivered the opinion of the court:

The plaintiff, Robert Esnault-Pelterie, is a citizen and resident of France. At a comparatively early age he became a student and experimenter in the science of aeronautics, attaining high rank as an inventor and practitioner in the art of aviation. The United States Patent Office on November 3, 1914, granted to plaintiff letters patent #1115795 under circumstances to be referred to in detail later in this opinion.

Plaintiff in the petition charges the defendant with having infringed his patent rights, and specifically relies upon the
41 validity of claims 2, 5, 6, 7, 8, and 9 of the letters patent to sustain the charge. The suit is brought under the act of June 25, 1910 (36 Stat. 851), as amended by the act of July 1, 1918 (40 Stat. 705), and section 155 of the Judicial Code.

In the first brief of defendant the jurisdiction of the court was challenged and a repetition of the defense was included in defendant's second brief. The defense was not pressed in oral argument, and, as we understand it, was finally abandoned. At any rate, finding II with respect to this issue is amply supported by the record and we have no doubt as to our jurisdiction under section 155 of the Judicial Code.

The defense to the suit is predicated upon three grounds: First, the invalidity of the patent because anticipated by the prior art and lack of novelty; second, the claims are not supported by the disclosure; and, third, the claims should be restricted to the precise devices described, and defendant did not use or cause to be manufactured any airplanes embodying this precise mechanism.

Plaintiff's patent is for what is known in the art as the "joy stick", a single vertical lever so connected with the equilibrium controlling organs of an airplane as to enable the pilot thereof to cause the same to assume any required attitude in flight. The novelty of the invention and detail of its construction, as well as operativeness, we will discuss later in this opinion.

The solution of the present controversy, despite familiarity with same, involves a repetition of the principles of flight, and at this point it is essential to state and keep in mind that we are dealing with an art at a time when it was in an initiatory, formative state. The possibility of flying a heavier-than-air machine had but recently been demonstrated, i. e., a plane propelled by motive power and carrying a passenger or passengers when the plaintiff's inventions were applied for, and the various devices and mechanisms developed to control the stabilizing organs of the plane in flight, indisputably demonstrate that the necessity therefor was imperative, and existing ones, to say the least, not satisfactory.

It is a scientific fact that it is the reaction of the air upon the wing surfaces of a plane that supports the same in the air through which it travels. To secure this reaction in the type of machine involved, a propeller and a motor are employed. A minimum of maintained speed is indispensable to flights. Two types of control are involved in the piloting of a plane, i. e., directional and equilibrium control. Directional control is effected by the functioning of a vertically hinged control surface located generally in the rear of the fuselage, a control surface which corresponds to a rudder on a ship and is operated by the pilot to direct the course of the plane and correct yawing if the same should occur. The steering of an airplane in normal flight is not usually a critical control. "It is", as finding X states, "immaterial whether the machine flies toward one point of the compass or another so far as its safety is concerned."

Equilibrium or attitude control, on the other hand, involves two vital and important factors, i. e., longitudinal equilibrium control and lateral equilibrium control. Longitudinal equilibrium control is effected by the functioning of what is known in the art as an "elevator", which is in fact a horizontally hinged rudder located
42 at the rear of the fuselage, capable of being moved upward or downward by the pilot, thus varying the angle of attack of its surface, thus lowering or raising the rear of the aeroplane, and enabling the pilot to either ascend or descend as his flying course exacts.

Lateral equilibrium control is effected by what may be fundamentally termed "wing distortion." Originally in order to accomplish this a portion of the outer end of each wing surface was constructed to yield to a warping force whereby one such surface was inclined upward and the opposite downward, producing a resultant decreased lift on one surface and an increased lift on the opposite one, thus causing the plane to roll about its longitudinal axis.

Maintenance of lateral equilibrium is a factor of extremely vital importance to safety in flight. Unequal air currents, air pockets, and tumultuous atmosphere, all invisible to the pilot and constantly to be anticipated, very frequently disturb the lateral equilibrium of an airplane, and it is of very great importance that this temporary loss of equilibrium be immediately regained.

The original process of wing warping has been generally if not universally superseded by ailerons, which are concededly direct mechanical equivalents for wing warping. (See Wright Co. v. Herring-Curtiss Co., 204 Fed. 597, 607, 608, later sustained by the Circuit Court of Appeals, second circuit. See 211 Fed. 654.) Ailerons are standardized portions of the outer rear wing surfaces, hinged in place and capable of movement so as to distort or alter the contour or form of a portion of the wing surfaces and thus obtain precisely the same air reactions obtained by wing warping. Their presence neither increases nor diminishes the total wing surface, and they are operated by the pilot for lateral equilibrium control.

A rolling movement or change of attitude from horizontal flight is incidental whenever the pilot wishes to turn the plane to the right or left. The turning of a plane is effected by means of its rudder, and to avoid sharp turns calculated to produce skidding, or, as stated in evidence, "side-slips", banking is resorted to, i. e., a more or less gradual inclination of the plane designed to overcome any centrifgal force brought into play by the turning movement, and the so-called "banking movement" is effected by the pilot operating the organs of lateral equilibrium control, the ailerons. The differential drag of the wings of a plane, manifest when the plane is banked or subjected to the rolling movement, develops a deviation from its directional course, i. e., "a yaw", the degree of which is dependent upon the angle of the roll and "upon the character of structure employed for altering the wing surfaces."

The uncertainty of atmospheric conditions and their contrariety of movement in a majority of the time during flight induce simultaneously a disturbance of both longitudinal and lateral equilibrium, and to correct the same "it is necessary that the airplane shall be tilted in an oblique vertical plane lying between the longitudinal and transverse planes of equilibrium or attitude control." In other words, the pilot may not resort to a sole banking movement as in effecting a turn but must simultaneously incline or tilt the plane at such an oblique angle as will restore the same to normal equilibrium. The frequency of disturbed air conditions and the various angles of resistance involved therein render it necessary to
43 meet this complicated control condition in the majority of instances of attitude control.

While turbulent air conditions may be met at any altitude, it is not disputed that a disturbed condition of the air generally prevails until an altitude of two or three thousand feet is reached, and due to this precarious condition present at landing and taking off it is

most essential to provide simple means for controlling the equilibrium and proper attitude of the plane. The crucial problem in the very beginning of designing airplanes for flight was as the Wright brothers said in 1908, "exactly what we knew it must be—the question of equilibrium."

The utility of ailerons to control lateral equilibrium; of elevators to accomplish ascent and descent; of a rudder to effect directional control; of a stabilizing surface near the rear of the fuselage to aid horizontal equilibrium of the plane, as well as dihedral wing surfaces, was old in the art. The problem facing aviators during the period of time involved herein was the creation of an appropriate and effective means for manually controlling the above stabilizing organs of the plane, a means which would enable the pilot to easily and with a minimum of mental effort effect the maneuvers incident to flight, add materially to its safety, and simplify operativeness.

Prior to a detailed discussion of the patent in suit, it is necessary to consider three related French patents issued to Esnault-Pelterie, plaintiff, based upon applications filed in France prior to the filing of the United States application which matured into the patent in suit.

These French patents are tabulated herewith in the order of their date of issuance, and for the sake of brevity will be hereafter referred to as the Esnault-Pelterie French patents numbers 1, 2, and 3, respectiveiy.

Number 1: French patent to Esnault-Pelterie, #372753, entitled "An airplane with two pairs of movable wings", applied for December 19, 1906; granted February 28, 1907.

Number 2: French patent to Esnault-Pelterie, #373763, entitled "An airplane with deformable wings to give it equilibrium and with stabilizing and elevating rudders", applied for January 19, 1907; granted March 28, 1907.

Number 3: French patent to Esnault-Pelterie, #373818, entitled "Airplane", applied for January 22, 1907; granted March 28, 1907.

Number 1: French Patent to Esnault-Pelterie, #372753

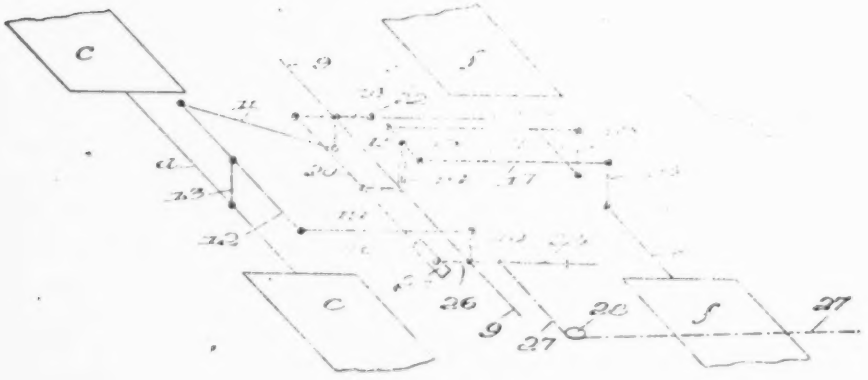
The disclosure of French patent number 1 relates to an airplane having two pairs of wings arranged in tandem. Each pair of wings is supported upon shafts which are rotatable in the fuselage so that the angle of the attack of the wing surfaces with respect to the air may be altered. The shaft connecting the front pair of wings is solid so that the angle of attack of the two wing surfaces of either side of the fuselage is always the same. The rear pair of wings is mounted upon separate shafts, thus enabling the rear wings on each side of the fuselage to be adjusted to different angles of attack under certain conditions.

44 A rudder movable about a vertical axis is mounted at the rear of the fuselage adjacent the rear pair of wings, this rudder functioning to give directional control.

The rotatable wings function to impart longitudinal and lateral equilibrium control to the airplane and as the mechanism which imparts the controlling movement to these wings and rudder is somewhat of a complicated nature, and requires detailed consideration, fig. 4 of this French patent is illustrated here in order to more clearly disclose its operation.

The basic elements of this controlling system comprise two horizontal levers, 22 and 23, respectively, each universally mounted with respect to a horizontal shaft 9. Horizontal levers 22 and 23 are so mounted that the outer ends or right-hand ends of these levers, as

Fig. 4.



French Patent 372,753
M. Esnault-Pelterie

shown in the above figure, are adapted to be grasped by the right and left hands of the pilot, respectively. The inner end of these levers extends beyond the shaft 9 and is interconnected by a cross member 20 which is fastened to the right-hand lever 22 by means of a ball and socket joint, and to the left-hand lever by means of a slot or sliding connection.

The cross member 20 is connected at its middle point with a horizontal part 19 of a right-angle lever also pivoted on shaft 9, the vertical portion of which 14 carries at its top a crossbar 16 connected by linkages 17, 17, to levers 18, 18, connected to the respective shafts e, e, of the rear wings f, f. The right-hand lever carries a downward extension arm 10 connected by a link 11 to a horizontal cross member 12 carried on a vertical arm 13 connected to the shaft d, upon which the front wings c, c, are mounted. The left-hand lever car-

ries an upwardly projecting member 10 connected by a similar link 11 to the left-hand end of the cross member 12. The left-hand lever 23 is connected by a flexible cable 27 to the aforementioned vertical or directional rudder not shown in this particular figure.

45 By virtue of the universal mounting of horizontal control levers 22 and 23 on the shaft 9, the pilot can impart to each of these levers either a horizontal or vertical movement, or a movement in an oblique direction which possesses both vertical and horizontal components. A horizontal movement of the handle end of lever 22 or the horizontal component of an oblique movement of this lever imparts a sidewise movement to the cross-connecting member 20 which through the member 19 imparts a rotative movement to the vertical portion 14 of the L-shaped member 19, 14; such movement imparts a rotation to the crossbar 16 which in turn through the links 17 imparts a differential movement to the rear wings e, e, causing one of these wings to increase its angle of attack and the other to decrease its angle of attack. Such horizontal movement or horizontal component of movement of the right-hand lever 22 thus effects the lateral equilibrium control of the airplane in a direction causing the airplane to roll in the direction in which the horizontal lever 22 is pushed.

The longitudinal equilibrium control of the machine is described as being effected by raising or lowering the handle end of the right-hand lever 26; such control, however, is complicated by the fact that the right and left-hand levers are interconnected by the cross member 20 in such manner that the inner ends of each lever form a fulcrum point upon which cross member 20 pivots. Such longitudinal equilibrium control, as is described, can, therefore, only be effected by movement of the right-hand lever in a vertical plane at a time when the left-hand lever is held in a fixed position by the left hand of the pilot. Any movement of the left-hand lever in a vertical plane will act to shift the fulcrum point and move the front wings in a contrary direction and thus cause a variation in the amount or degree of equilibrium control applied to the plane by movement of the right-hand lever through a given distance.

This variable effect of relative vertical movement of the right and left-hand levers is further complicated by the fact that the right-hand lever is connected to the pair of front wings by a downwardly projecting member 10 and link 11 whereas the left-hand lever is connected to the front wings by means of an upwardly projecting member 10 and link 11. Any vertical movement of levers 22 and 23 therefore exerts a contrary or opposite longitudinal equilibrium controlling effect.

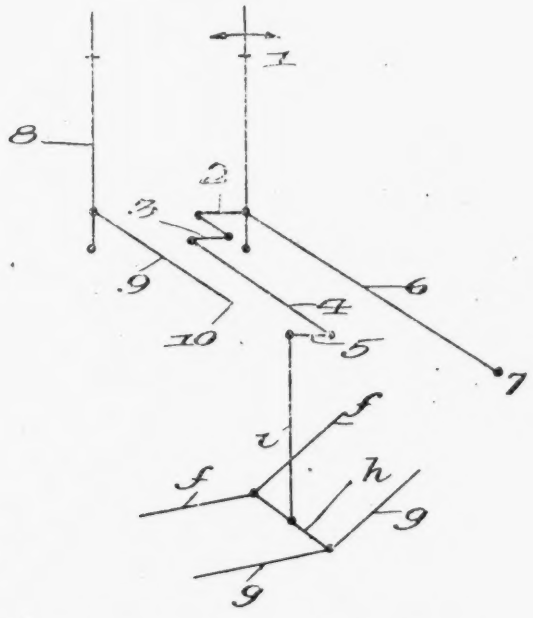
This patent therefore discloses "a two stick" longitudinal equilibrium control in which the pilot must manipulate two horizontal interconnected sticks and must continuously maintain his hold upon both of the said levers, and in order to obtain longitudinal equi-

librium control by a vertical movement or vertical component movement of the right-hand lever he must, at the same time, maintain the left-hand lever stationary and in a predetermined position.

Number 2: French Patent to Esnault-Pelterie, #373763

The structure herein disclosed comprises an airplane of the monoplane or wing wind type in which the wings are deformable or dis-

Fig. 6.



French Patent 373,763
M. Esnault-Pelterie

tortable in order to obtain lateral equilibrium control. A pair of vertical and horizontal rudders is mounted on a wing member at the rear of the fuselage, the vertical rudders giving directional
46 control and the horizontal rudders giving longitudinal equilibrium control. The ring is so mounted that the vertical rudders may be deflected in a substantial vertical plane, and the horizontal rudders may be deflected substantially in a horizontal plane.

The mechanism effecting the control of the plane, as illustrated in fig. 6 of this French patent, is illustrated here.

The vertical lever 8 is connected by a link 9 to a lateral point of the link carrying the rudders. Movement of the lever 8, fore and aft, moves the ring in such a manner as to cause the directional rudders to function. The vertical lever 1 which is on the right hand of the pilot seat, is mounted on a ball-and-socket joint. Inclination of this lever to the right will cause a pull in a forward direction on link 4 rotating a cross member *h* in such a direction as to cause a pull on the left-hand bracing wire *g* connected to the relative portion of the left-hand wing and at the same time releasing the tension on the bracing wire *g* going to the rear of the right-hand wing. Reversed conditions apply to the bracing wires *f*, *f*, so that an inclination of the vertical lever 1 toward the right will cause the plane to roll to the right, and vice versa.

A forward movement of the vertical lever 1 causes a pull on the link or rod 6 which is connected to the bottom of the ring; therefore the forward motion of lever 1 pulls the bottom of the ring forward and moves the horizontal rudders in such a direction
47 as to cause a nosing down of the airplane. Moving the lever 1 in the opposite direction or back will cause the plane to nose up. The French patent also refers to the advantages due to the fact that the lever 1 may be movable in an oblique direction and therefore simultaneously introduce transverse and longitudinal equilibrium control.

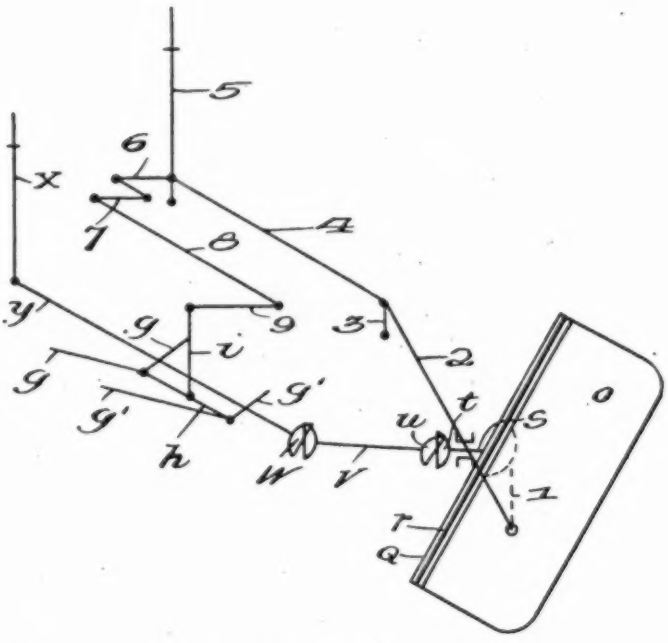
As disclosed in this French patent, each of the vertical levers thus had a separate and independent function, the left-hand lever being utilized for directional control of the plane and the right-hand lever being utilized to maintain both lateral and longitudinal equilibrium control. The directional equilibrium response of the plane follows and is in accord with the angular displacement of the right-hand lever.

Number 3: French Patent to Esnault-Pelterie, #373818

This patent discloses an airplane of the monoplane type quite similar to that disclosed in the Esnault-Pelterie French patent number two; the only substantial difference is in the construction of the tail. Instead of having separate vertical and horizontal surfaces for directional control and longitudinal equilibrium control, respectively, the disclosed construction has a single surface which is mounted on a normally horizontal axis. This surface is capable of movement on this horizontal axis so as to increase or decrease the lifting effect of this tail surface, thereby controlling the inclination or attitude of the plane on its longitudinal axis. This tail surface may also be rotated about the longitudinal axis of the plane, thereby causing the rear of the plane to yaw to one side or the other, thereby introducing a directional control.

As disclosed in fig. 4 of this French patent, reproduced on the next page, the left-hand lever x by its movement from side to side rotates the bar y and through the universal joints w, w rotates the rear control surface about the longitudinal axes of the plane for directional control. The right-hand vertical lever 5 is universally mounted at its lower end and by manipulation from side to side effects lateral equilibrium control in the same manner and in the same direction as

Fig. 4.



French Patent 373,818
M. Esnault-Pelterie

described in connection with the previous French patent number two. Movement of the lever 5 in a forward direction pulls on the wire 4 and link 2, which is connected with a dependent horn 1, thus giving the rear control surface a greater angle of attack and causing the plane to nose down, a reverse or backward motion of lever 5 causing the airplane to nose up, the directional response of the airplane therefore being in accord with the inclination of the universally mounted vertical lever 5.

As more fully set forth in finding VI, plaintiff actually constructed and operated an airplane of the type disclosed in this French patent. This machine is now a part of the collection in the Conservatoire des Arts et Metiers in Paris.

Plaintiff at first executed an application for United States letters patent based on all three of his French patents discussed supra. This application, however, reached this country too late for filing within the statutory time limit with respect to the first French patent. Plaintiff then executed a second application for United States letters patent basing the same on his French patents numbers
48 two and three and omitting reference in the oath to his first French patent. This is the application which matured into the patent in suit. As the facts relating to the filing of these applications are fully set forth in finding VII, it is unnecessary to reiterate them here. It is sufficient to add that from consideration of the file wrapper of the United States application, which matured into the patent in suit, it is apparent that the same is directed to the same invention and monopoly disclosed in the second and third French patents, and, therefore, under the second paragraph of section 4887, Patent Statutes, which relates to priority by treaty, the filing date of the patent in suit, which so far as the invention is expressed by the claims in suit relates back to January 19, 1907, and January 22, 1907, respectively, the filing dates of the Esnault-Pelterie French patents numbers two and three which disclosed to those skilled in the art the arrangement and operation of the control elements which we have specified in our consideration of these patents in suit.

We quote herewith this pertinent portion of section 4887, title LX:

"An application for patent for an invention or discovery or for a design filed in this country by any person who has previously regularly filed an application for a patent for the same invention, discovery, or design in a foreign country which, by treaty, convention, or law, affords similar privilege to citizens of the United States shall have the same force and effect as the same application would
49 have if filed in this country on the date on which the application for patent for the same invention, discovery, or design was first filed in such foreign country, provided the application in this country is filed within twelve months in cases within the provisions of section forty-eight hundred and eighty-six of the Revised Statutes. * * *"

As the plaintiff's first French patent was not issued until February 28, 1907, and was not published until April 18, 1907, this patent cannot be considered as prior art. At this point, however, we will also refer to the first paragraph of section 4887, which states:

"No person otherwise entitled thereto shall be debarred from receiving a patent for his invention or discovery * * *, unless the application for said foreign patent was filed more than twelve months * * * prior to the filing of the application in this country, in which case no patent shall be granted in this country."

Because of this section of the statutes it would be impossible for plaintiff to obtain a monopoly under the United States patent for the same invention disclosed in its first French patent but the

statute does not preclude him from obtaining a monopoly by virtue of the United States patent for an invention which differs from or is a patentable improvement upon the structure disclosed in its first patent.

We will discuss the question of the effect of the first French patent more completely after we have given consideration to the patent in suit.

The Patent in Suit

The patent application, which matured into the patent in suit, was filed in the United States Patent Office on January 16, 1908, and was, as already indicated, based upon the two embodiments disclosed, respectively, in the plaintiff's French patents numbers two and three. The drawings as filed in the application contained figure 6 and 4 of plaintiff's French patents numbers two and three, heretofore illustrated.

The Patent Office's first action required the applicant to supply new drawings which should set forth the mechanism in greater detail. In response to this request plaintiff filed new drawings on February 1, 1909, which included figures 6 and 10 illustrating specifically the control mechanism which we reproduce on the following page for the purpose of illustration.

With reference to these figures the specifications of the patent state in part as follows:

Figure 6

"The distorting of the wings and the control of the inclination of the rudders can be performed in the following manner: To a vertical lever 61 mounted on a ball and socket and located, for example, on the right hand of the pilot, is connected, on the one hand, through an arm 62, an angle lever 63, a horizontal bar 64 which is hinged to the end of a horizontal arm 65 keyed at right angles on the vertical rod 55 operating the stay-wires. On the other hand the said lever 61 is connected through a rod 66 hinged thereto, to an attachment 67 on the lower end of the ring 58 (Figs. 4 and 5). It will now be seen that by moving the lever, either to the right or to the left, the rod 55 is induced, through this system of transmission, to rotate and thereby the wings are distorted, thus controlling the transverse stability. Moreover, by moving the said lever 61, forward or backward, the rod 66 will be pulled or pushed, and the rotation about an imaginary horizontal axis, that is, the forward or backward inclination of the ascensional rudder 60, will be obtained. Furthermore, by moving the said lever 61 in a direction intermediate the right or left and the front or back, the rod 55 and the rod 66 will be simultaneously affected, that is, the means for controlling the transverse stability and the means for controlling the longitudinal stability will be simultaneously actuated.

"Another lever 68, symmetrically arranged with the lever 61 as regards the pilot seat, is again connected through the rod 69, to a

lateral point 70 of the ring 58; thus by moving it fore or aft, the rotation about an imaginary vertical axis of the ring 58 and consequently of the directing rudder 57 will be effected."

Figure 7

"At the rear part of the covering 9 is the double-hinged rudder 71 formed with a horizontal plane or concave surface. The said rudder is so mounted that it can be turned about its longitudinal horizontal axis 72 which, for example, may be hollow and may engage a cylindrical fixed bar 73 used as a holder. To this bar 73 is connected an axis 74 (fig. 10) mounted in a bearing 75 and fixed to the first fork

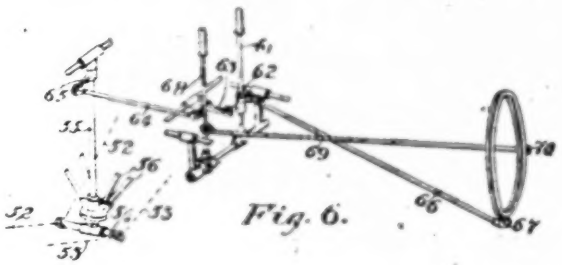


Fig. 6.

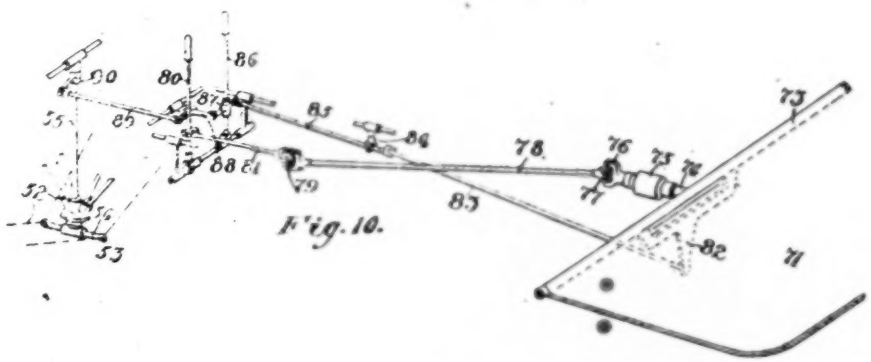


Fig. 10.

76 of a Cardan joint, the second fork 77 of which is connected, through a bar 78, to a second Cardan joint 79 which is itself connected to a vertical lever 80, through a longitudinal and horizontal bar 81. On the other hand, the hollow axis 72 of the rudder 51 is secured to a vertical rod 82, connected through a rod 83 hinged to a small vertical arm 84, to a longitudinal bar 85 ending in another lever 86 placed symmetrically with the lever 80 with reference to the pilot's seat 28. On the one hand, it will be possible with the lever 80 which is moved either to the right or to the left, to cause the bar 81 and with it the bar 78 of the axis 74, to turn and thus to turn the rudder 71 about the said axis 74, and consequently to lower one side and raise the other. Such working has the effect of generating a horizontal power which causes the machine to turn and permits of steering horizontally. This is the way the

birds and particularly the seagulls use their tails when they desire to turn. On the other hand, by moving the lever 86 forward or aft the rudder is caused to move about its axis 72, so as to lower or raise its front part. This is the way by which the longitudinal stability of the aeroplane will be controlled and the ascent or descent of the latter will be obtained. Moreover the lever 86 is connected through a horizontal bar 87, to an angle lever 88, and a longitudinal bar 89 hinged to the said lever, with an arm 90 perpendicular to the rod 55 which, in turn is secured to the bar 54. When moved either to the right or to the left the lever 86 which is mounted on a ball and socket at its lower end, will cause the rod 55 and thereby the transverse bar 54 to turn, which will have the effect of distorting the front pair of wings.

"The lever 86 is, furthermore, adapted to simultaneously actuate the rod 55 and the rod 85 in a manner similar to that described above in relation to the lever 61, fig. 6."

The facts relating to the disclosure of the patent in suit, and the details of the embodiments thereof, are specifically set forth in our findings XIII, XIV, and XV. We have, however, inserted the above illustrations and have quoted from certain portions of the patent, which we believe establish an entirely satisfactory basis of disclosure for the claims in suit. The "single vertical lever movable in every direction for controlling", shown in detail in both illustrations and described in the specification, and its connection are so illustrated and described that its direction of movement to produce a given response in the equilibrium control of the airplane is instinctive in character.

There is considerable contradictory testimony in the record by the various experts for both the plaintiff and defendant on the question of instinctive control. Defendant's experts urge that there is no virtue in having the equilibrium control lever or "joy stick" so connected to the control surface that instinctiveness plays a part in the manipulation of this lever by the pilot. The defendant in its brief urges that the operation of the joy stick is a matter of acquired habit. We agree with this latter statement with the qualification, however, that any given habit is easier to acquire if it is instinctive rather than contra-instinctive.

There is no doubt that every human being automatically attempts to maintain his balance or equilibrium at all times and if moved off balance in any direction instinctively effects an opposite mental and muscular response to restore his body to a normal vertical position. This is fundamental knowledge and it is unnecessary to amplify it further, other than to observe that this automatic or instinctive balancing action is well apparent to anyone who has walked the deck of a steamship while it is rolling and pitching.

52 This balancing instinct is made use of in the universally pivoted vertical control lever or the joy stick control of the patent in suit in the manner illustrated by the figure reproduced here.

The full lines of the figure are illustrative of a pilot in level flight. If, due to disturbed air conditions, the plane is caused to nose up or down, the pilot's body, due to his balancing instinct, will tend automatically to assume either the forward or rearward dotted line position, respectively, and his mental instincts will thus tend to cause him to push forward or pull backward on the joy stick, which in each case will so operate the controlling surfaces in a proper direction to restore the airplane to its previous level attitude. The same instinctive reaction will also take place when the plane rolls from side to side or assumes a position in which both longitudinal equilibrium and lateral equilibrium are disturbed. If the pilot desires to initiate a departure from level flight, the banking of an airplane when making a turn being an example of this, he has the natural instinct to lean or incline his body just as a motorcyclist does and here again the directional response is in accord with the pilot's instincts. The directional response is thus always in the proper direction with a minimum of mental effort on the part of the pilot.

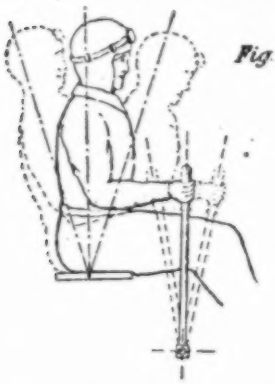


Fig D.

In certain abnormal conditions, such as when an airplane is in a spinning nose dive or is flying in fog or through clouds, the pilot cannot trust to his balancing instinct. The fact that the suppression of the natural balancing instinct necessitates special training in order that the pilot may be able to successfully meet these abnormal flying conditions, in our opinion emphasizes the use of the balancing instinct in normal flight conditions. (See finding XII.)

Brigadier General B. D. Foulois, a witness for defendant, who was at that time assistant chief of the Army Air Corps, had been connected with aviation since 1908, and had flown many types of planes, testified with reference to the joystick control as follows:

"* * * I would say that the control that we are using today, as compared to the controls that we have used in the past, is much less complicated, much easier to learn, much easier to handle, and easier to operate and control your airplane in connection with all the other various pieces of equipment and instruments that you have to handle in the plane.

"41. Q. Does your statement apply to the Dep control as well as to the stick control?

"A. I would say that the present stick control is the most satisfactory control we have ever had from the standpoint of operating your airplane, and from the standpoint of minimum amount of attention which may be required to operate all the other various pieces of equipment that you have in a plane to take care of."

It is true that the operation of the equilibrium-control lever in a direction responding to reflex or instinct, while specifically included

in claim 7, is not discussed in detail in the specification.
53 While the specification does not specifically make any reference to its advantages, they are, nevertheless, present and inherent in the detailed disclosure to which we have referred, and anyone practicing the teachings of this patent by the utilization of its disclosure will realize the benefits of this instinctiveness which are inherent in the structure disclosed. Moreover, anyone reading the patent would not neglect to read the claims and study the patent in its entirety.

It would be contrary to established precedents to hold that an omission from the specification of a discussion of the fact that the control is instinctive in direction, invalidates the patent, when such instinctive directional movement is inherent in the operation of the mechanism found in the detailed disclosure of the patent. (See Wezel & Naumann Aktiengesellschaft *v.* Morgan Lithograph Co., 54 Fed. (2d) 235, 237). In this case the court said:

"It would certainly seem contrary to justice to hold that this inadvertent omission which every one would unconsciously supply, and which could not possibly interfere with the practice of the art, should nevertheless deprive the patentee of the reward of his efforts. I think that would be carrying the technicality of the patent law too far."

One reading the specifications of the patent and studying its operation, and assuredly one operating the described mechanism, could not, if skilled in the art, escape knowledge of the fact that instinctive directional movement was a factor inseparably present in the form of construction specified. It does not exact elaboration to demonstrate to those skilled in aviation the scientific facts attendant upon resuming equilibrium when the same is disturbed either in the air or upon the ground. If the mechanism responds in operation to all human instinctive movements to restore equilibrium and the disclosure exhibits this fact by specifying its operation, this we think meets all the requirements of the patent law.

In making this statement we are cognizant of the fact that in Fig. 7a of the Esnault-Pelterie patent in suit, illustrated above, and which is not specifically described in the specification, the rudder horn 82 is reversed from the other figures and is mounted on the upper side of the tail surface of the airplane 71. In this figure, which formed no part of the original disclosure, the horn is connected to the vertical control lever 86 by means of a control wire or very thin rod 83. As the tail surface of the airplane has a lifting effect and has a downwardly curved contour for this purpose, it does not take a high degree of mechanical knowledge or skill to see that such
a construction is inoperative in that the wire or rod 83 will
54 bend or buckle by application of the lifting force on the tail surface 71 which is hinged at 73. There has been testimony in the case that points to the fact that this inoperative construction is due to a draftsman's error.

Whatever the origin of this contradictory figure, however, its effect on the disclosure of the patent as a whole, to those skilled in the art, appears to be nil.

Mr. Roche, senior aeronautical engineer for the Matériel Division of the Air Corps at Wright Field, who testified as an expert in this case on behalf of defendant, after referring to the inconsistent disclosure of Fig. 7a, was questioned as follows:

"State what kind of a structure you would produce in view of the specifications, the figures and the inconsistencies which you have considered, referring to the birdtail only and its control and assembly." He answered:

"I would construct something very much the same as the installation on the 'Vought' airplane tested at Langley Field * * *."

The structure tested on the Vought airplane comprised a tail surface with the tail control rod connected to an arm or horn underneath the tail surface, as disclosed in Fig. 10 of the patent in suit, and with the movement of the control stick in an instinctive direction. This opinion of the defendant's expert seems clearly to indicate what the man skilled in the art would construct from the teachings of the patent in suit.

If those skilled in the art, in constructing the mechanism from the information furnished by a patent, would naturally construct it so that it would possess a certain capability and mode of operation, that capability and mode of operation must be inherent in the disclosure and a characteristic of the invention expressed in the patent.

Such an evident mistake in this figure of the drawings should not render the patent invalid. (See Van Meter v. Irving Air Chute Co., 27 Fed. (2d) 170, 173.) In the Van Meter case the patentee was suing the United States under a special jurisdictional act for infringement of what he specified a "parachute apparatus or aviatory life buoy." Fig. 12 of the patent drawings disclosed constructive features and, as the court observed, it "would be hazardous for the wearer to pull the cord of the parachute in question, for throwing aside the casing and opening the chute while he continued in his seat" (p. 173). The court in the opinion said:

"This was evidently a misconception of the draftsman of the sketch. The patent is not invalid, or the claim limited to the illustration, because of this mistake or lack of understanding. See Temple Pump Co. v. Goss Pump Co., 58 Fed. 204."

The illustrated detail of construction pointed out by defendant's counsel is, we think, so obviously an error that anyone skilled in the art would at once discover it. Assuredly it is not of such consequence as to indicate a lack of apprehension on the part of the patentee as to the precise character of the mechanism he conceived and its operativeness. This obvious error was not carried into the specifications, and in all proceedings relative to the plaintiff's patent ap-

plication, played no part. Under this state of facts it is evident in our opinion that lack of utility in plaintiff's mechanism may not be predicated upon such a mistake in patent drawings.

55 Defendant contends that there has been an illegal expansion of the original invention into the monopoly as expressed by the present claims in suit. This is based upon the argument that the plaintiff did not insert claims directed to the vertical stick control until 1913 although his application was filed in 1908, and during the intervening period the device had come into general use in the United States. The contention is based upon the premise that there is a lack of equity in permitting an applicant to continue an application in the Patent Office indefinitely and to present claims directed to previously unclaimed subject-matter years after its filing date and after competitors have established actual manufacture or use.

Such doctrine obviously constitutes an exception to the long-recognized right of a patentee to claim subject-matter disclosed by him at any time so long as his patent is not yet issued.

The file wrapper and contents of plaintiff's patent disclose the proceedings in the Patent Office with respect to plaintiff's application and issue. Patent Office proceedings and patentee's responses to the same with respect to laches on the part of the latter are fixed by statute. In this case the limitation placed by law within which plaintiff must respond to action upon the part of the Patent Office was one year, and the record does not establish that plaintiff ever exceeded this period of time in responding. The Supreme Court in the case of Overland Co. v. Packard Co., 274 U. S. 417, in an exhaustive opinion involving this precise issue, decided that patent rights were conferred by statutes, and when a patentee complied with statutory provisions as to time limitations within which to proceed to obtain an issue, laches could not be imputed to him, even if he availed himself of every single day of the time allowed. The doctrine of equitable estoppel is not available to defeat patent rights if the record establishes conformity with the patent laws. In deciding this issue the court said (page 423):

"Counsel for the alleged infringer says, that even with the time limit for action on the part of the applicant thus reduced to one year, it becomes easily possible for an applicant, after an action by the Patent Office upon his application, to delay for the full period of a year his response to such action, and however promptly the Patent Office may again act, he can delay another full year before replying to it, and thus, by waiting a year after each official action, (1) keep his application pending so as to enable him to withhold, indefinitely, his invention from the public, (2) add claims to his application covering the independent intervening developments of others, and (3) postpone the time when the public may enjoy the free use of the invention—all contrary to sound public policy.

"The answer to this argument is that the matter is entirely within the control of Congress, and, in order to avoid the evil suggested. Congress may reduce the time within which one who is seeking an

adjustment with the Patent Office, in order to obtain a patent, shall act upon receipt of notice of a decision of the Patent Office, in the course of the application through that office. Congress, as we have seen by the history of the statute, reduced this time for an indefinite period in 1861 to two years in 1870, and to one year in 1897, and, as provided in the last Congress, to six months. Act of March 2, 1927, c. 273, 44 Stat. 1335"—

56 and again, on page 425, used the following language:

"A party seeking a right under the patent statutes may avail himself of all their provisions, and the courts may not deny him the benefit of a single one. These are questions not of natural but of purely statutory right. Congress, instead of fixing seventeen, had the power to fix thirty years as the life of a patent. No court can disregard any statutory provisions in respect to these matters on the ground that in its judgment they are unwise or prejudicial to the interests of the public."

In addition, it is evident and the findings show that plaintiff from the filing of the application to its date of issuance has continuously directed claims to the equilibrium control.

When the application was filed it included claims in the following phraseology:

"4. An aeroplane in which the controlling is effected by two separate levers, rigid transmissions for controlling the distortable wings and both rudders."

* * * * * * *

"6. An aeroplane in which the controlling methods of the rear tail forming the rudder is carried into effect by means of two levers symmetrically arranged with reference to the pilot seat, the left-hand lever, for example, causing through a cardan system, the rotation of the rudder about a longitudinal horizontal axis, and the moving of the right-hand lever causing the inclination thereof about a transverse horizontal axis."

Interpreting claim 4 by referring to the specifications and drawings as orginially filed, it is apparent that it covered lateral and longitudinal equilibrium control.

In its action of March 10, 1908, the Patent Office objected to the specification and all of the claims, and the patentee responded to this action by filing a revised specification, cancelling the claims as filed and substituting new claims therefor, this amendment being received in the Patent Office February 1, 1909, which was within the statutory period of one year allowed for response. Included in this amendment were two claims, as follows:

"2. An aeroplane having distortable wings for maintaining transverse stability, a rudder for maintaining longitudinal stability, a lever controlling said wings and said rudder, a steering rudder, and a separate lever controlling said steering rudder."

"13. An aeroplane having means for controlling its inclination and a single lever for operating said means to control both the

longitudinal and the transverse stability of the apparatus, said lever being arranged to oscillate in different vertical planes, means for transmitting its movement in one plane to the means for governing the longitudinal inclination, and means for transmitting its movement in the other plane to the means for determining the transverse stability, said lever being mounted to permit also an oblique movement having components in each of said planes so as to actuate simultaneously the means for establishing longitudinal stability and that for establishing transverse stability."

Claim 2 remained continuously in the case during the entire Patent Office proceedings, was allowed by it as claim 2 of the patent in suit, and is now one of the claims in issue. While the patentee, during the prosecution of his application, may have at various
57 times inserted more narrow claims specifying in a more detailed and more limited form the connections of the control lever, its arrangement with respect to the controlling surfaces, and the direction of response, the insertion of progressively narrower claims is but the usual method of prosecuting an application in the Patent Office and does not indicate an abandonment by the patentee in his attempt to obtain a patent monopoly on the equilibrium control.

Claim 13 to which we have referred, supra, and which includes the "single lever" for operating the equilibrium controls "said lever being arranged to oscillate in different vertical planes", and thus being directed to the universally mounted vertical lever, was canceled as the result of a Patent Office rejection on May 23, 1912.

On June 12, 1913, the patentee filed a new set of limited claims among which were claims 5, 6, 7, and 8 of the patent in suit, which claims are now in issue. The fact that from May 23, 1912, to June 12, 1913, or for a period of slightly over a year, there was not pending in the Patent Office a claim of the character as exemplified by claim 13, quoted above, is without import as at no time was there any abandonment of the broad monopoly as expressed by claim 2.

However, viewing this matter entirely aside from claim 2 and the continuity of the broad monopoly covered thereby, there was a lapse of but approximately thirteen months between the cancellation of claim 13 and the renewal of claims for substantially the same subject matter before the Patent Office. Such period is well within the two-year period rule defined by the Supreme Court in Chapman v. Wintroath, 252 U. S. 126, and Webster Co. v. Splitdorf Co., 264 U. S. 463, in which latter case the rule is applied to claims inserted in divisional cases, where there has been a disclosure to the public by the issuance of the parent application.

In the case at bar there could be no assumption of abandonment of any right to the public during this lapse of thirteen months, for during this period the application was pending in secrecy in the Patent Office, and the public was given no disclosure such as exists in the case of a reissue or a patent subsequently issued on a divi-

sional application. (See Diamond Power Specialty Corp. v. Bayer Co., 13 Fed. (2d) 337, 339.)

Such cancellation of claim 13 and the subsequent renewal of substantially the same subject-matter occurred while the contract between the inventor and the public was in a formative state in the Patent Office. As it now appears, the rejction of claim 13 and its cancellation was a mistake which the Patent Office later rectified when it allowed substantially similar claims. But mistake or not, this action by applicant was subject to reconsideration as long as the Patent Office would grant such a review.

For the reasons just outlined, and particularly in the absence of a disclosure to the public by the inventor, we fail to see how a defense of intervening rights can be established.

Aside from this consideration, however, the facts in the case at bar do not warrant any defense of intervening rights. As stated in detail in findings XXXVIII and XXXIX, the planes in public use in the United States in 1912 made use of the Wright and Curtiss types of control which were essentially different from the "joy stick" control of the patent in suit, and there is no evidence that any airplane was in existence in the United States at any
58 time when the Esnault-Pelterie application did not contain either claim 13 or the later substituted claims.

The defendant in written argument contends "that in every branch of mechanics, control levers are invariably positioned where dictated by convenience, expedience, ease of control, and available space conditions", and asserts that "the disposition of any lever is universally recognized as a matter only of mechanical skill or expediency representing the mere selection of the designer."

If the plaintiff's patent alleged to have been infringed, and the claims involved in this litigation contain no more than a mere rearrangement of elements functioning as they did in his French patent no. 1, obviously the general statement of the defendant just quoted would have great weight. Assuredly the simple process of transforming a horizontal lever into a vertical one is manual and involves workmanship instead of invention.

Invention, it has been said, originates in mental conceptions evidenced, so far as this case is concerned, by practical and operative devices or mechanisms inherently new and novel, and if the plaintiff's patent fails to meet this test obviously it is invalid. The defendant does not challenge the fact that invention is present when a patentee makes use of elements old in the art and by a new and novel combination thereof produces a mechanism which functions in a new way. If this precedent had not long since been established inventive progress would be decidedly impeded, and the exercise of the inventive faculties restricted to a very limited scope.

The Wright brothers were the pioneers in this art. Quoting from one of their many interviews and articles, we find this statement, a matter of record in this case, "The problem of the real power-

driven flying machine was exactly what we knew it must be—the question of equilibrium." Plaintiff, although he endeavored to, did not solve that problem; his mind, so far as present issues are concerned, and his experiments were directed toward the creation of a mechanism which would control the organs of an airplane which admittedly function to restore equilibrium when it is disturbed, a mechanism as indispensable to the flight of a plane as the wing surfaces thereof.

The Wright patent to be considered in this case was issued May 22, 1906, and the mechanism disclosed to operate the organs of equilibrium and directional control are described in finding XXXI. It was a cradle located upon the lower wing of the plane and connected with the directional rudder at the rear of the same, and also with the wings, so that the pilot flying in a prone position on the wing of the plane could by movements of his body shift the cradle to either the right or left and thus alter the angle of attack of the wing surfaces. Longitudinal equilibrium was obtained by a horizontal rudder or vane, as the finding discloses, located in front of the main surfaces and operated manually by means of a roller located in front of the pilot.

If the ingenuity of scientists in this art had exhausted itself in the control mechanism of the Wright patent, it is not exaggeration to state, but clearly observable, that the modern airplane would never have been developed. We think we may with confidence assert that there is not a single airplane patent cited as prior art
that does not embody attempts to not only simplify a control
59 mechanism, but concerted efforts to create one capable of
functioning efficiently, and following the demonstration of the possibility of flight by the Wright brothers, inventors turned their attention to this important feature of airplane control.

The development of control mechanisms exhibits that the difficulties encountered were manifold, and the frequent and instantaneous necessity of operating simultaneously certain organs of control, as well as single ones, was not one of instant and easy solution. The pilot of a plane has various duties to perform, and it would seem that an operative mechanism which simplifies and expedites the performance of the same embodies something more than mere mechanical skill.

Inventors repeatedly resorted to dual lever control devices, some of them very crude and others approaching a solution of the problem. The findings show that prior patentees to the plaintiff employed levers and wheels to effect control of the organs of stabilization and directional control. Some inventors used vertical levers; others, horizontal levers, and still others, a combination of levers and wheels. All of them, however, including plaintiff's French patent number one, combined operativeness in such a way that the levers and wheels engaged both hands of the pilot and possessed operative defects in the way of inseparable operation which was

capable at least of confusing the pilot and fraught with a degree of inoperativeness which precluded their general adoption.

Obviously complication in the operation of a control mechanism, apparent to all interested in the art, centered attention upon mechanisms which would obtain control responses without the inherent defects which characterized those in existence. The art, as we have said, was developing rapidly. Structural improvements and machinery were revolutionizing it, and the need for effective mechanism was acute and imperative. The very best minds of the scientists interested were active in its promotion.

On the preceding page of this opinion the illustrated mechanism of plaintiff's French patent no. 1, #372753, is inserted. A repetition of its structural features and operativeness is not essential. It is sufficient to observe that plaintiff's conception as embodied therein was evidently predicated upon a false scientific basis as to the structural features of a successful airplane, and the reaction of essential elements to the air in order to secure equilibrium. The control he attempted to exert over his illustrated organs of control, i. e., the wing surfaces, rudder, etc., of his new plane, was in no sense adaptable to his subsequent planes or to the numerous other planes then perfected for flight. We are confirmed in this respect by defendant's own distinguished expert. On cross-examination he was asked: "In the 1906 patent what would be the result if you were to merely turn the lever 22 upward instead of rearwardly in a horizontal direction as it is in the patent?" The response to the question is as follows: "It would not work." Again he was asked, "You would still, by moving it forwardly and backwardly, control the longitudinal stabilization but you could not execute the lateral movement necessary for lateral stabilization." The answer was, "You could not."

In addition to what we have just said, the record shows that plaintiff's scientific knowledge immediately disclosed to him the
60 fatal defects in his first French patent, and he promptly abandoned it. No such device was ever constructed, and, almost immediately following, the vertical lever mechanism came into existence. In the case of Olmsted v. Andrews & Co., 77 Fed. 835, 839, cited in defendant's brief, the court said: "It is not, however, invention to cause a device to work vertically that theretofore operated horizontally." The patent in the Olmsted case was for a map case, a device to secure a map in a convenient and accessible form and preserve it from the effects of constant exposure to the air.

The prior art cited in anticipation of the patent was extensive and apropos, and obviously from it the conclusion was inescapable that all the patentee did was to rearrange elements long since combined to accomplish precisely what the plaintiff's patent did. The alleged similarity between the Olmsted case and the instant one is nonexistent. We are dealing here with a developing scientific art of vast importance and in a formative state. The Wrights flew

their first plane in 1903 and plaintiff's French patents are dated in 1907, but four years later. A successful and approved operative mechanism functioning to control the ailerons, elevator, rudder, etc., of an airplane when in flight and advance the art towards perfection we feel confident in saying had not been invented.

Plaintiff's experiments and his own flights enabled him to comprehend the necessity for a mechanism such as he conceived. He brought into tangible form a single vertical lever combined with essential operative elements which successfully operated the organs of an airplane it was designed to operate, and in a way they had not been operated previously, and this he accomplished as a noted scientist in the art and after years of experimentation and knowledge of its needs and in no other way. In Robinson on Patents, Vol. 1, pp. 122–123, the author states:

"To him alone whose mind conceives the perfect, practical, operative idea—that idea which, when embodied in tangible materials, will accomplish the desired result—belongs the right of the inventor and the credit of performing the inventive act."

Viewing the two patents retrospectively and years after the patent in suit has firmly established its worth, it is not at all strange that the changes effected by the patentee in the two devices disclosed give rise to a conclusion that all that was accomplished by the change was a mere rearrangement of elements and one which would readily suggest itself to one skilled in the art. True, no one skilled in the art suggested the change and as established by the record no previous inventor comprehended the additional and vastly important results which the new mechanism brought about.

In the case of Root Refining Co. v. Universal Oil Products Co., 78 Fed. (2d) 991, 995, recently decided, a case involving the general principles of patent law applicable to patents which although simple in construction are nevertheless an advance in the art, the court used the following language:

"What Dubbs did now seems simple and just what any one skilled in the art would have done. 'This, however, is but the common history of important inventions, the simplicity of which seems to the ordinary observer to preclude the possibility of their involving an exercise of the inventive faculty.' Carnegie Steel Co. v. Cambria Iron Co., 185 U. S. 403, 22 S. Ct. 698, 709, 46 L. Ed. 968. 'It is
61 often difficult to determine whether a given improvement is a mere mechanical advance, or the result of the exercise of the creative faculty amounting to a meritorious invention. The fact that the invention seems simple after it is made does not determine the question. If this were the rule, many of the most beneficial patents would be stricken down.' Expanded Metal Co. v. Bradford, 214 U. S. 366, 29 S. Ct. 652, 655, 53 L. Ed. 1034."

On the other hand, judging efforts and accomplishments in the light of the contemporaneous development of the art, so radical a departure from the mechanism disclosed in plaintiff's first French patent, both in structural features and operativeness, as well as re-

sults which followed, must, we think, compel a conclusion that plaintiff's patent discloses a new and novel mechanism, one accepted and put into almost general use in light airplanes and continued in such use to the present day.

Esnault-Pelterie brought suit against the Chance Vought Corporation for an alleged infringement of the same patent involved in this case. The cause was first heard in the United States District Court for the Eastern District of New York, and decided by that court in a written opinion announced February 29, 1932 (56 Fed. (2d) 393). The District judge dismissed plaintiff's bill of complaint and subsequently on appeal to the Circuit Court of Appeals the decision of the District Court was affirmed (66 Fed. (2d) 474). The opinion of the Circuit Court of Appeals follows substantially the opinion of the lower court.

From statements of facts in both opinions we are confirmed in our belief that the record before this court must be in some important particulars very different from what it was before the courts mentioned.

In speaking of plaintiff's 1906 patent #372,753 both opinions hold that the whole equilibrium of the machine may be controlled by the pilot by the use of one hand. The evidence in this case, as previously observed, is to the contrary and emanates in part from defendant's expert witness. It is obvious from the present record that the control mechanism of the 1906 patent would be wholly inoperative if the horizontal levers were simply transposed into vertical ones, and we fail to find in the record any controversy over the fact that the 1906 mechanism engaged continuously both hands of the pilot, and, in addition to this, the expert testimony establishes that any vertical movement of levers 22 and 23 of the 1906 patent would result in a contrary or opposite longitudinal equilibrium control.

A conspicuous divergence in proved facts between the record in the Vought case and the instant one appears from the statement in the Vought opinions wherein it is stated (page 401 of the District Court's opinion) that "in neither of the machines embodying such invention, manufactured abroad, was the plaintiff able to accomplish sustained flying for any considerable distance." Again, in the opinion of the Circuit Court of Appeals it is said (page 475), "None was ever put into commercial use", and on page 477 it is stated "nor was it used in the only embodiment made by the patentee."

Manifestly an omission to supply testimony of the importance noted above, especially as to the reception accorded the mechanical device of plaintiff by those skilled in the art and its almost universal use in light airplanes in both this country and abroad, would lead inevitably to the quoted statements. Findings VI and XLVII portray what the record in this case indisputably establishes, and supply positive proof of precisely what the plaintiff accomplished, both in the matter of making flights and the commercial demand for planes embodying his invention.

62

It is true the defendant seeks to minimize the importance of plaintiff's flights and in so doing cites their brief duration and slight altitude attained. "His flights", the defendant says, "may be better denominated as 'hops'." It is true that some of them were of brief duration and the altitude obtained in nowise extensive; however, it must not be overlooked that on the date of plaintiff's initial flights even "hops" in a heavier-than-air plane were accomplishments. Assuredly the defendant would not designate the flight of the Wright brothers at Kitty Hawk in 1903 a hop, and yet it did not greatly, if at all, exceed the first flights of the plaintiff. The modern airplane motor had not at that time made its appearance.

Prior Art

The defendant in its brief refers to the French patent to Laroze as the most important disclosure.

The Laroze patent was considered by the Patent Office before the patent in suit was issued and was discarded by the examiner as not anticipatory.

The Laroze patent discloses an airplane provided with a vertical control lever, which can be swung in a fore-and-aft direction for the purpose of controlling the longitudinal attitude of the machine. A wheel is mounted vertically on the top of the lever. By means of swinging the wheel the lever may be rotated about its own vertical axis for the purpose of controlling the transverse attitude of the airplane. By turning the wheel on its horizontal axis the machine may be steered.

The result of this construction is that if an attempt were made to operate the longitudinal control by grasping the wheel on one side by one hand there will inevitably result a movement of the lateral control as well. When the pilot wishes to nose up or down he will also find he is operating the lateral control. Lateral control movement similarly results also in a disturbance of the longitudinal equilibrium.

This control could not be operated by one hand. Both hands must be used, one on each side of the wheel, in order to keep the movable lever or post in any predetermined position. But, even under these circumstances, the Laroze control of equilibrium is very confusing mentally and physically. If we imagine the vertical lever stationary and a lateral control movement to be given by the pilot swinging the wheel with two hands, it is evident that one hand and arm will move forward while the other hand and arm are moving backward. But in the majority of instances compound movements are required involving lateral and longitudinal equilibrium control simultaneously. This means that the arms will be required to make opposite movements for the lateral control, and forward or backward movement simultaneously for the longitudinal control. Essentially this requires sometimes a backward movement of one hand and a long forward movement of the other hand, or a slight forward move-

ment of one hand and a long backward movement of the other
63 hand, or perhaps no movement whatever of one hand and a long forward movement of the other hand. Or if the maneuver requires an opposite longitudinal control movement, the longer movements would be in a backward direction. As these control movements frequently are required to be instantaneous, the confusion, both mental and physical, is apparent.

When this is contrasted with the single direct movement of the joy stick in any direction to correct any combination of longitudinal and lateral control movements which are ever required, the value of the joy stick is apparent.

Another feature of the Laroze patent is that the patentee connects his steering control inextricably with his attitude control. Such steering not only superimposes upon the hands and arms the necessity for reverse movements in a different plane, but in addition to this it changes the value of all of the lateral control movements. This is apparent because, as the two hands rotate the wheel to steer, they require either less or more movement to effect a given amount of lateral control.

The Laroze patent does not disclose any single directional response which causes the plane to move in the direction the joy stick is moved. Nor does the Laroze control with its complicated motions in any way involve the instinct of the pilot. The Laroze patent does not possess a steering lever separate from the equilibrium control and with all these marked differences we believe it to be clear that the Laroze French patent does not anticipate any of the claims of the patent in suit.

The German patent to Schussler, #85326 of 1896, dates back to a time when aerial dynamic flight and its problems were unknown and is typical of some of the earlier visionary and inoperative structures of that period. This patent discloses an umbrella-like wing as a supporting means; a cage-like frame is connected to the approximate center of this wing by means of a universal joint mounting, this frame containing a seat for the aviator. This device is intended to be propelled through the air by means of a pair of oars which is operated by the feet of the aviator. There is a dependent rod which is rigidly attached to the wing, the lower end of which is provided with a crossbar which the aviator grasps in his hands. This dependent steering rod is stated "to give the sail any desired inclination in relation to the frame." The best operation which we can ascribe to this disclosure is that the wing might function as a kind of parachute, and by pushing or pulling at the rigid rod attached thereto the aviator may shift his bodily position in the universally mounted framework in which he sits with respect to the umbrella-like supporting surface and thus change the center of gravity. The Schussler patent does not disclose any of the fundamentals of the broad claims, 2 and 6, in suit which require that equilibrium control and steering be separate; also Schussler

has no "means" such as an elevator for maintaining longitudinal equilibrium and no "means such as distortable wings" for producing lateral equilibrium. The disclosure of the Schussler patent is not anticipatory of the claims in suit.

United States patent to Simpson 909,468, was issued January 12, 1909, subsequent to the application for the patent in suit,
64 but on an application filed January 14, 1907, approximately five days before the effective date of the patent in suit. It therefore merits consideration from the standpoint of prior invention.

This patent discloses and relates to a boat of the hydroplane type. The hull of this boat is formed of two parallel pontoons, and when the boat is under propulsion these pontoons are intended to be lifted from the surface of the water by three submerged depending hydroplane surfaces, one of which is located at the front and two at the rear of the boat. These hydroplane surfaces are pivoted to the hull, and cables are connected to them and lead to a drum located at the lower end of a vertically disposed column adjacent the pilot's seat. By means of a horizontal wheel fixed to the top of the column the drum may be turned and the cables wound about or released from the drum. The pilot by turning the wheel thus simultaneously controls the lifting effect of all three of the hydroplane surfaces.

The vertical shaft rotates in a sleeve which is universally mounted, so that by bodily moving the vertical wheel in any direction the pilot tilts the shaft and can thus move the drum at the lower end thereof in any direction. By such an arrangement if the pilot pushes the wheel forward such motion increases the incidence of the front hydroplane and decreases the incidence of the rear hydroplane, thus causing the boat to incline upward at the bow. The bodily movement of the wheel to the right increases the incidence of the right hydroplane, causing the boat to roll to the left, and vice versa.

We have grave doubts that this structure, which is in the marine art and adapted for propulsion on water, is analogous art in the present instance, in which we are dealing with aerial navigation in which directional control is necessitated in all directions.

Entirely aside from this consideration however, we find the control system of the Simpson patent closely approximating the structure of the control system of the Laroze patent discussed in detail, supra, and therefore differing from the invention in issue for this and other reasons.

The Simpson control, like the Laroze control, comprises an operating wheel mounted on the upper end of a movable column. Such mounting fails to provide any fixed fulcrum for the operation of the wheel, and any single force applied at any point on the operating wheel has no fixed or determinable response. Moreover, during all times that the Simpson boat is under way there is a pull or tendency on the cables to unwind from the drum, which tendency is transmitted to the wheel in the hands of the pilot. The pilot by maintaining this wheel in a more or less wound-up condition gives to the hydroplanes their lifting effect, and should the pilot perchance

release the rim of the wheel at any time the cables will unwind from the drum and the lifting effect of the hydroplanes will be negatived. As the top of the column on which this wheel is mounted is itself movable in all directions, the pilot must therefore continuously hold the wheel with both hands, as the release of either hand will permit the wheel to move relative to the movable column.

We fail to see how this complicated control structure either anticipates or suggests to those skilled in the art the single lever airplane equilibrium control of the patent in suit. In addition, and with respect to the more limited claims, the tilting of Simpson's wheel
65 and column in any given direction is intended to produce a corresponding rise of the Simpson boat in that direction, which is exactly the reverse of the instinctive action and directional response found in the more limited claims 7 and 8 of the patent in suit.

United States patent to Wadsworth 213079; British patent to Wilson 20022, of 1889; and United States patent to Weeber 704156, may be considered together, as they are all clearly nonanalogous art. The patent to Wadsworth, while disclosing a single vertical lever mounted on a universal joint, is adapted for the control of two engines or mechanisms, one engine being controlled by the motion of the vertical lever in one plane and the second engine or mechanism being controlled by the motion of the lever in a plane at right angles to the first plane. The patent discloses that these two engines may be respectively the steering engine and the propelling engine of "steam vessels or traction engines and the like." Certainly this patent, issued in 1879, does not in any sense suggest the concept of the equilibrium control of an airplane.

The British patent to Wilson relates to a horizontally mounted lever movable in all directions and operating a series of electrical circuits for the remote control of searchlights, guns, telescopes, and the like. There is no fixed relationship between any given position of the control lever and the position of the device controlled by it. This patent contains no reference whatsoever to aviation.

United States patent to Weeber relates to a steering and braking device for automobiles. It comprises a steering handle or tiller adapted to be swung from side to side for steering the vehicle, and the same lever is movable in an up and down direction or forwardly and rearwardly, with respect to the driver, for applying the brake of the vehicle. These functions are obviously entirely remote from the equilibrium control of an airplane, and the mere fact that an automobile may possess the same kind of an engine (internal-combustion engine) that an airplane has, or that the airplane moves on a surface of the ground prior to take-off and subsequent to landing, does not, in our opinion, place the Weeber disclosure in an analogous art, but whether analogous art or not there is nothing whatever in the disclosure of these three patents which would suggest to those skilled in the art the lateral and longitudinal equilibrium control of an airplane by means of a single universally mounted lever.

The remaining prior art patents, discussed by defendant in its brief, namely, the French patent to Penaud and Gauchot, British patent to Davidson, French patent to Macedo, German patent to Jung, and British patent to Quentin, have been considered in detail in our Findings XXV, XXVI, XXVII, XXX, and XXXV, respectively, and it is unnecessary to reiterate here the facts relating to their disclosures. As indicated in these findings, all of these patents lack one or more of the essential elements necessary to anticipate the invention in suit.

The Ferber Defense

Defendant ascribes paramount importance to the work of Captain Ferber of the French Army. From 1902 to 1906 Captain Ferber carried on aeronautical experiments with gliders and airplanes. His first experiments were carried on at Nice, France, and he
66 continued them there until 1904, thereafter transferring his location to an Army post at Chalais-Meudon. In 1904 Ferber published a booklet entitled "The Progress of Aviation since 1901 by Gliding Planes", and in 1906 his second publication, entitled "The Progress of Aviation by Gliding Planes—Step by Step, Jump by Jump, Flight by Flight", made its public appearance.

We discuss these publications and what followed their introduction somewhat in extenso, because not only the defendant emphasizes their importance as a defense, but the United States District Court for the Eastern District of New York, 56 Fed. (2d) 393, in an opinion holding plaintiff's patent rights to a narrow and restricted scope, afterwards affirmed by the Circuit Court of Appeals for the Second Circuit, likewise accorded them determinative weight, which we believe under the record before us and the principles of patent law we cannot follow.

Captain Ferber was a very distinguished and capable pioneer in the art of aviation. His 1904 booklet is a very comprehensive review of the progress of the art, setting out the contributions of well-known experimenters, including among others Lilienthal, Pilcher, Chanute, Wright brothers, Professor Langley, and other well-known persons interested in bringing into being a successful flying airplane. The book abounds in numerous illustrations of the general appearance of the structural features adopted by the experimenters mentioned and discussion of accomplishments. In this volume he does not mention the experiments of plaintiff, and as to the others, especially as to any detail of equilibrium control such as here involved, the disclosure is without merit, and valuable in the art only from a scientific standpoint as to the chronological progress disclosed in its evolution from gliders to motor-propelled planes. This booklet as we view it possesses no probative value in an effort to establish anticipation in this case.

Ferber's 1906 edition is precisely in accord with its title, a continuation of the series of events and progress made in the develop-

ment of the art, copiously illustrated and generally descriptive. Both publications disclose and describe an airplane, as finding XL shows, having a front elevator and triangular "focs" or jibs located at the opposite extremities of one of the supporting plane surfaces. These jibs were mounted to turn on a vertical axis and when turned acted to increase the resistance of that end of the plane, thereby having a directional steering function. In neither of said publications is there any description of the means by which said "focs" or "jibs" were controlled, and no disclosure whatever of the operating means or mechanism for controlling the longitudinal or lateral equilibrium of the planes. We have searched with the utmost care to discover wherein either publication in any way teaches or instructs those skilled in the art any concept of plaintiff's invention. We think they do not, and that finding XL is amply sustained by the record. What we have just said is confirmed in fact by the proceedings of the defendant exemplified by the taking of testimony in France. The belated depositions taken some twenty-five years after the event, so far as directed to an attempt to establish knowledge upon the part of plaintiff of Captain Ferber's work in France prior to his invention date, i. e., January 19, 1907, are admis-
67 sible; such knowledge of course would preclude the possibility of his believing he was the first and original inventor of the invention claimed.

The depositions, however, went further into the subject matter, and from the discussion of the Ferber defense as it appears in both the opinions of the District and Court of Appeals of New York, cases cited supra, we infer consideration was given this testimony wherein the witnesses amplified the prior publications of Ferber in the way of detail recitals of the structural features of Ferber's planes. Judicial precedent precludes the consideration of such evidence offered for that purpose. The authorities are numerous and to the precise point.

Section 4923, Revised Statutes, provides as follows:

"Whenever it appears that a patentee, at the time of making his application for the patent, believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery, or any part thereof, having been known or used in a foreign country, before his invention or discovery thereof, if it had not been patented or described in a printed publication."

In Milburn Co. v. Davis Co., 270 U. S. 390, 400, the Supreme Court in deciding the effect of the foregoing statute, said:

"* * * and by the words of the statute a previous foreign invention does not invalidate a patent granted here if it has not been patented or described in a printed publication. Rev. Sts. Sec. 4923. See Westinghouse Machine Co. v. General Electric Co., 207 Fed. 75", and in the Westinghouse case referred to in the opinion the court said:

"* * * Section 4923 deals specifically with the effect of knowledge and use in a foreign country, and it makes no distinction whether such use is made or such knowledge is acquired by persons who, after using the thing or acquiring the knowledge, remain abroad or come here. This section (4923) provides that the patent taken out by an applicant for the same thing here shall not be void on account of such knowledge or use unless the invention had been patented or described in a printed publication. As we construe this section, reduction to practice in a foreign country can never operate to destroy a patent applied for here, however widely known such reduction to practice may be, either among foreigners or among persons living here, unless the invention be patented or described in a printed publication. To that extent section 4923 qualifies the language of section 4886, which without such qualification might well lead to a different result."

The probative value of prior publications is to be found in precisely what the publications state. If the articles relied upon describe the invention "in full, clear, and intelligent terms as to enable persons skilled in the art to comprehend it, and reproduce the article claimed, without assistance from the patent", manifestly priority of invention is established. The Circuit Court of Appeals for the Southern District of New York, in the case of Badische Anilin & Soda Fabrik v. Kalle et al., 104 Fed. 802, 808, used this significant language.

"Nor would the knowledge or experience of any number of chemists (unpublished to the world) that the phrase was 'erroneous', or 'a mistake', or 'an interpolation' change the situation.

68

The 'description in a printed publication' of the statute is to be found within the four corners of such printed publication. Judge Coxe tersely and accurately expresses the law and the reason for it in the following passage:

"'The question is, What does the prior publication say? not what it might have said, or what it should have said. If prior patents and publications can be reconstructed by extrinsic evidence to fit the exigencies of the case, the inquiry will no longer be confined to what the publication communicates to the public, but it will be transferred to an endeavor to ascertain what its author intended to communicate.'"

In the case of Permutit Co. v. Wadham, 13 Fed. (2d) 454, 456, the Circuit Court of Appeals for the Sixth Circuit said:

"Such publications cannot be effectively supplemented by proof that foreign devices which are now said to be the embodiments of the publications were actually constructed at the time and did successfully perform. Such proof is self-destructive. There can be no need for it unless upon the theory that the actual construction shows precisely what was intended by the published description; and, if the description is ambiguous enough to need this kind of support, it is fatally deficient."

Additional authorities are available; we will forego their citation. The rule is so firmly established and the reason for it so apparent that we experience little hesitancy in saying that the prior publications of Captain Ferber as a matter of fact fall so far short of establishing anticipation and fail so perceptibly to establish prior knowledge of his work upon the part of the plaintiff, that the evidence offered served only to delay a final determination of this case. From the present record it is our opinion that the Ferber defense is vulnerable in the respects noted and does not supply a basis either of anticipation or to in any way enlighten the court as to the operating means employed for controlling the longitudinal and lateral equilibrium of his planes. The fact that Ferber succeeded in flying an airplane, and was the first aviator to do so in a foreign country, does not in the light of the record before us disclose more than the possession of some general means for controlling the organs of equilibrium, and leaves us without knowledge as to his mechanism. The issue presented to this court is limited to an alleged invention for controlling the longitudinal and lateral equilibrium of an airplane separately from steering control when the same is disturbed, by a single instrumentality taking the form of a vertical lever and known as the "joy stick."

The Bleriot Defense

Defendant also contends that Louis Bleriot, a French experimenter and manufacturer of airplanes, was the inventor of the "joy stick" control, as exemplified by plaintiff's patent. This contention is predicated upon a letter written to Armengaud, the patent attorney for Esnault-Pelterie, by P. A. Vautrin who constructed an airplane for Bleriot, which letter and sketch accompanying the same are set forth in finding XLIII. The letter was written on February 10, 1911. Reference is also made to an agreement prepared and
69 signed by Esnault-Pelterie and Bleriot on November 1, 1911. The preamble of this agreement contains the following recital:

"In consequence of claims made by Mr. Esnault-Pelterie against Mr. Bleriot, relative to his single bell lever, Mr. Bleriot has been able to prove to Mr. Esnault-Pelterie that he was in prior, legitimate, and personal possession of the invention—that is to say, of the single lever mounted on a cardan joint—by proofs accepted by Mr. Esnault-Pelterie."

The expression in this contract, "in prior, legitimate, and personal possession of the invention" is a phrase peculiar to the French patent law. It indicates the secret possession of knowledge legitimately obtained and is not an admission of priority of invention. Neither the Vautrin letter of February 10, 1911, with its sketch, nor the contract between Esnault-Pelterie and Bleriot under date of November 1, 1911, is indicative in any manner to show what knowledge, if any, the plaintiff Esnault-Pelterie had of Bleriot's work on January 19, 1907, the effective filing date of the patent in suit. The

defense is without merit to establish previous invention, and for the additional reason stated in finding XLVI.

The prior art cited by the defendant, in our opinion, signally fails to establish anticipation, and if we are correct in our consideration of the subject there is not a single art structure in the record disclosing a mechanical device where the entire equilibrium of an airplane may be controlled with a single instinctive tilt of a single control stick in any direction, causing the plane to tilt in a similar direction.

Plaintiff's mechanical structure accomplished what had not theretofore been accomplished. The mechanism patented supplied precisely what the art at the time and in many respects needed. It is, we think, not to be challenged for lack of novelty or restricted to a narrow scope because of its simplicity when, as we believe, it was not only adaptable to existing airplanes of varying types but actually installed therein and continuously used.

Plaintiff was experimenting in an art that exacted a high degree of scientific knowledge. That he was capable and efficient is not denied, and to bring his conception of a control device into operation and adapt it to heavier-than-air flying machines exacted more than mere mechanics, for unlike mechanisms stationary in character plaintiff in making his invention had to possess the knowledge requisite to an understanding of the elements of the air, the various means and instrumentalities employed to engage or combat them and thereby attain successful flight. No one would now say that a horizontal elevator, constructed and attached to an airplane as it is now, involved no more than mechanical skill, because it must have been known that a successful airplane would of necessity have to ascend and descend. From the beginning the question of an efficient control of the various elements for maintaining the attitude of an airplane was an important and indispensable one.

Of course, plaintiff's system was an improvement over prior ones. Most patents, we may safely say, are for improvements. De Forest's basic radio tube can scarcely be identified when compared with improved ones. Future development attended Edison's incandescent lamp, and plaintiff's patented system embodied in his device was likewise a forward step adapted to secure control of the essential elements of an airplane established and recognized as scientifically adapted to obtain flight.

Common knowledge obtained by sight alone discloses that an airplane in taking off tilts in some degree and that prudent pilots do not obtain altitude precipitously. Descents and landings are not accomplished save by resort to equilibrium controls, and while a plane may maintain its attitude under some conditions without resort for a considerable time to equilibrium controls, it is manifest that no airplane, however constructed, would even so much as leave the ground without their presence, and in addition to this it exacted

considerable time and effort to finally create a mechanism that would successfully function to actuate the control organs, and add to the safety of flight.

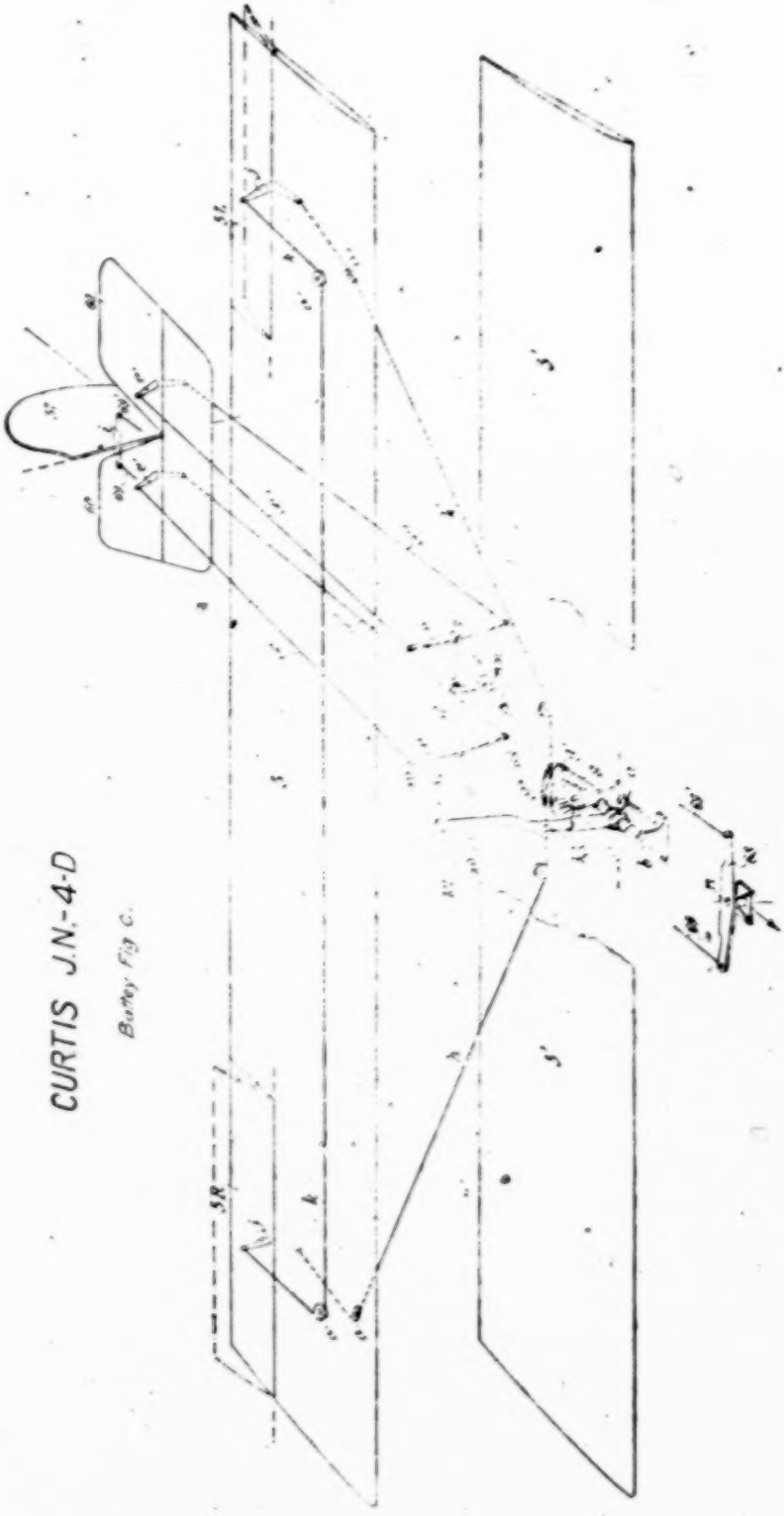
The system which we believe the plaintiff invented combined simplicity of operation with natural laws of gravitation and introduced into the art a safe, effcient, and scientifically constructed mode of control, not theretofore in use or invented, and all that remains is to discuss the issue of infringement.

Infringement

Three types of airplanes, known respectively as the Curtiss, De Haviland, and Loening, are alleged to infringe the patent in suit. (See finding XIX.) As set forth in detail in our findings XXI and XXII, all three of these types of airplanes in general possess a single vertical control lever or "joy stick" universally mounted at its lower end so that it is capable of moving or tilting in any direction. A transverse movement of this lever operates a hinged portion of the wings of the airplane so that the contour of the wing surfaces is distorted or altered for the specific purpose of controlling the lateral equilibrium of the plane. Manipulation of the "joy stick" or lever in a fore-and-aft direction controls a rudder or rudders pivoted on a horizontal action in such a manner as to control the longitudinal equilibrium of the airplane. In all of the Government structures the connections existent between the "joy stick" and the control surfaces of the airplanes are of such a character as to cause the airplane to tilt in the same direction as the tilt of the stick, and the response of the airplane is thus in accord with the instinctive balancing sensations of the pilot.

All of the Government structures possess a separate lever (foot operated) for controlling the steering rudder. For the purpose of making the Government construction clear we reproduce on the following page one of the exhibits in the case which illustrates the Curtiss construction. The structure of the De Haviland airplane and the Loening airplane is functionally the same as the Curtiss and in construction of details substantially similar to this illustration.

Referring to this illustration, a sidewise movement of the "joy stick" 61 operates through the cables hh' which are connected to hinged portions of the ends of the upper wing 5, known in the art as ailerons. Manipulation of these ailerons causes a change in contour, or a distorting of the ends of the wing. As we have already stated in our opinion, "The original process of wing warping
72 has been generally if not universally superseded by ailerons, which are concededly direct mechanical equivalents for wing warping. (See Wright Co. *v.* Herring-Curtiss Co., 204 Fed. 597, 607, 608, later sustained by the Circuit Court of Appeals, second circuit. See 211 Fed. 654.)"


CURTIS J.N.-4-D
Burley Fig C.

A fore and aft movement of the "joy stick" 61 operates, through lever arms e e and the cables connected thereto, to raise or lower the horizontal equilibrium control rudders 60, 60. The separate foot lever 68 controls the steering rudder 57 by means of cables.

The terminology of the claims in suit is found to apply to the Government structures word for word and element by element.

Defendant attempts two defenses with respect to the question of infringement. In the first defense it is suggested that the Government does not infringe due to the fact that the claims of the patent in suit use the word "stability." In this connection we quote claim 6 as an example of this use:

"6. In an aeroplane, the combination of means for producing lateral *stability*, means for producing longitudinal *stability*, means for steering in a horizontal plane, a single vertical lever movable in every direction for operating both said means for producing lateral *stability* and said means for producing longitudinal *stability*, and separate means for operating said steering means. [Italics ours.]

Defendant alleges that "stability" is that property of an object which enables it to return to its original position if it is disturbed, and states that "in modern airplanes that is accomplished by the fixed stabilizer in the case of longitudinal stability and by the dihedral angle of the wings in the case of lateral stability. These are parts of the structure, built into the machine and producing inherent automatic stability. The stabilizer and the dihedral are not subject to the manipulation of the joy stick. The latter is not in combination with them. Thus, the modern structures do not read on the claims." In other words, the Government urges that the modern airplane is self-balancing and is not dependent upon equilibrium "joy stick" control to preserve its proper attitude. Much testimony has been presented by various of defendant's experts as to the self-flying properties of the modern airplane. This argument, however, is to a certain extent fallacious as the three types of airplanes alleged to infringe cannot by any means be considered as modern, nor is it at all certain that they possessed this so-called self-flying property stressed by the defendant. As a matter of fact, Captain Hegenberger, one of defendant's expert witnesses, was asked specifically about the Curtiss JN–4. The question and his answer are as follows:

"Q. How about the JN–4? Has every plane of that type that you have flown had such inherent stability that you could fly it hands off?

"A. The JN–4 longitudinally bordered on instability."

In the second place, if an airplane can be designed to fly itself, why is it necessary to spend so much time instructing aeronautical pilots in the art of blind flying, as has been brought out by defendant's experts? If an airplane gets in a fog bank or a cloud and has this alleged property of flying itself by automatic inherent stability built into the plane, why does the pilot not

release the controls and let the plane fly itself? In fact why use the controls at any time?

The final answer to all this argument is entirely obvious. A patentee has the right to be his own lexicographer, and any court will unhesitatingly accept a definition of a word or phrase used by the patentee if it is ascertainable from the patent. It is no defense to a charge of infringement of an apparatus or a combination described in the claim in a patent that some part of it was misnamed therein by the patentee, or that the infringer has called it by a different name. (See Advance Rumley Co. v. John Lauson Mfg. Co., 275 Fed. 249; Century Electric Co. v. Westinghouse Elec. & Mfg. Co., 191 Fed. 350, 366.)

From the patent in suit it is entirely clear that by "stability" the patentee means what we have termed "equilibrium" or "equilibrium control" throughout this opinion.

The three alleged infringing planes of the Government all possess the single vertical lever movable in every direction for controlling the lateral or longitudinal equilibrium of the plane connected to controlling surfaces having the same functional effects as those disclosed in the patent, and the Government cannot escape infringement on the rather remarkable theory that the Government planes fly themselves.

The second defense theory advanced by defendant as to noninfringement is that the claims, if valid, should be limited to a combination comprising a single integral or unitary tail structure, and should not cover the tail structure such as is present in the Government airplane alleged to infringe, and which comprises an independent horizontal and vertical rudder.

It is of course well settled that the courts, in order to save the patentee from the invalidation of a claim, due to prior art or a prior use, will frequently put a narrow construction on a claim so as to conform it to the exact disclosure of the specification, and thus save the claim from invalidity. This is not necessary in the case at bar. As we have already indicated in our consideration of the rather voluminous prior art cited by defendant, there is nothing in the prior art which is of an anticipatory nature. The mere fact that the plaintiff elected in the patent in suit to disclose his equilibrium control lever and the separate steering lever connected to a particular kind of a tail structure should not limit the claims to use of that of an integral vertical and horizontal rudder structure. It is the controlling means or lever which is the essence of the invention at issue, as defined by the claims, and not the tail structure of the airplane. The only difference between the elevator and rudder of the Government structures and the elevator and rudder of the ring-tail embodiment disclosed in the patent in suit is that the former has separate mountings to the fuselage, while the latter has a single mounting to the fuselage. In each case the steering rudder and elevator possess similar functions.

There is some testimony in the case on behalf of the defendant as to what may be termed "cross responses." The theory of this is that

the mounting of the integral tail structure of the patent in suit is such as to cause the steering rudder control means to affect the equilibrium of the plane and the equilibrium control of the plane
74 to affect the steering control, and therefore certain claims do not properly find foundation in the specification of the patent in suit for steering means "separate" from equilibrium controlling means. There is no merit to this argument.

On July 16, 1931, plaintiff caused certain flights to be made at Amityville, Long Island, with a plane having a tail structure of the ring-tail type similar to that disclosed in the patent in suit. The facts as found in Finding XVII with respect to these flights were that the steering and stabilizing levers were mechanically separate and independent and each lever performed its own function, regardless of the manipulation of the other lever.

Also, in certain tests made by defendant of an airplane having a ring-tail structure it was found that when the ring-tail structure was restrained the cross responses were ngligible. (See finding XVI (c).) Such restraining of the ring-tail structure from side swing is in accordance with the disclosure of the patent in suit, which specifically refers to horizontal and vertical rudders. (See finding XV.)

Even without such restraining, such cross response as is present does not impair the operativeness of either the steering control lever or the equilibrium control lever, and each lever performs its own function regardless of the position of the other lever.

In conclusion we hold that the pat it is valid and has been infringed by the defendant. Plaint is therefore entitled to recover. Pursuant to an agreement of the parties it is ordered that the case be remanded and referred to Commissioner Gordon to take testimony upon the question of reasonable and entire compensation, and report to the court.

Whaley, Judge; Williams, Judge; Littleton, Judge; and Green, Judge, concur.

75 VII. *Judgment*

At a Court of Claims held in the City of Washington on the 24th day of January, A. D., 1936, judgment was ordered to be entered as follows:

Upon the special findings of fact, which are made a part of the judgment herein, the court decides as a conclusion of law that the plaintiff's patent is valid and has been infringed by the United States and that he is entitled to compensation therefor under the act of June 25, 1910, 36 Stat. 851, as amended by the act of July 1, 1918, 40 Stat. 705, and Section 155 of the Judicial Code.

76 [Clerk's certificate to foregoing transcript omitted in printing.]

(Endorsement on cover:) File No. 40517. Court of Claims. Term No. 963. The United States, Petitioner, vs. Robert Esnault-Pelterie. Petition for a writ of certiorari and exhibit thereto. Filed April 24, 1936. Term No. 963 O. T. 1935.

U. S. GOVERNMENT PRINTING OFFICE: 1936

Order allowing certiorari. Filed June 1, 1936

The petition herein for a writ of certiorari to the Court of Claims is granted. And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as though filed in response to such writ.

76744—36